$@Q\YRUbdQT\ TU\Qf_\e^dQT$

`_b

?_ ^QXQ^ : Tg QbTc

6SUBSQTU @Q|\RUbaQTTU|Qf_ |e^dQT

Hade_3 @Q\\RUdaQTTU\Qf_\e^dQT

I F@3 Xdd 3((ggg'SSU\'_bW(SSU\(UTgQbTc(g'\\\'Xd] \

6ed_b#\$3 : Tg QbTc%_^QbXQ^#0), &0. 1\$

; USXQTU SHUQSY 3) 2() 0(+))

@ c ceZUd_c 88: @3 H_TQc48\scY5_4HU__WQ4

@8 @Q1 UQ^_3 7?*-/*
@ c ce2Ud_c @83 pdbCQ

G_RWCW RO	QVV YY
DQWYQTU/dkde/	`QW*
DQbadU >: ^T_^TU cU Uh`\/\$Q^i QXKg wTYfUbc_c dtb] Y^_c i \Qc S_cQc aeU`UbadU^USU^Q\Q	
ceZUSYW^TU\9Y:Sebc_cYWeYU^dUc''''''	`QW+
GUSSYW^>: ^SeQ^d_Q/Q^QdebQUjQTU/Qf_/e^dQT''''''''	`Q₩+
GUSSYM^≯: ^SeQ^d_Q/QTUdUd] Y^QSYM^TU/Qf_/e^dQT'''''''''	`Q₩-
GUSSYW^>>>: ^\BU\QSYW^S_^U\\c\YWYWBQT_TU_c\d\b]\Y^_c%\Q^\USUc\TQT%\Q\]`_c\R\Y\TQT%	
Y'SQ`QSTIQT%UG'% TU8_^dYWU^SYQ''''''''''''''''''''''''''''''''''''	`QW2
GUSSYM^≯	
	`QW*-
$GUSSYw^{\prime}J^{\prime}: ^{SeQ^{\prime}\underline{d}} Q^{\prime}Q^{-}SYw^{\prime}TU^{\prime}Q^{\prime}RUbaQT^{\prime}i TU^{\prime}Q^{\prime}WU^{\prime}SYQ^{\prime}A_{\underline{b}Q^{\prime}}U^{\prime}U^{\prime}U^{\prime}U^{\prime}U^{\prime}U^{\prime}U^{\prime}$	`QW*1
$ DQbdU \gg : \ ^T_^TUcUS_^cYTUtQcYXQI \ _ \ `eUTUcUbSeQaeYUbdY_ TU \ 'RUbdQT \ TU \ 'Qf_\ 'e^dQT\% $	
$S_{\rm e} = {\rm QaeU}/{\rm QU^2}/{\rm QaeU}_c \ Q_{\rm e} \ {\rm QucU^3QTU}/{\rm QWD^4dUcU^3QTU}/{\rm $:
$] $$ $ LQUC4i $ cYdQ_S_cQ^e^SQVeU_\ \ eUTUS_^SURYCU'''''''''''''''''''''''''''''''''''$	1
1111111	`Q₩ +*
$ GUSSYW^* \Rightarrow A_cdtQ^*T_U_i \land Q^*WYUcd_ \\ \times S_^cYcdU^*SYQTU_iQ^_SYW^*Qt]_Y^*Q^*_TU_iQ_iYRUbdQTTU_iQf_ie^dQT%aeU_iQf_ie^*QTW_iQf_iQf_iQf_iQf_iQf_iQf_iQf_iQf_iQf_iQf$	
S_^cdQU^U,Qed_&TUdUdYWTUU^UbWQTU\Qf_\e^dQT''''''	`QW +*
GUSSW^≯J QbQc] Q^UbQcTU UFQT\bGe`eUcd_c_Q^dUbY_bbQ;_^Q] YU^d_8_^c\TUbQT_'''''	
	`Q₩+,
GUSSYw^>⇒GYSeQaeYUbUfU^d_DUcUQd_T_%J_\YdY_^U^`QddSe\Qb%eUTU\\UMQbQ`QcQb	
cY^SQecQTU ce UhYcdU^SYQ''' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '	`Q₩ +/
GUSSYW^≯'@Qf_\YSYW^cY`eUTU.cebWYbcY^SQecQY{ UTYQ^dU\QQ5dfYTQTTU\Q^QbebQU QTU\	l .
Q1 Q	`Q₩,)
GUSSYw^J':\]_cdtQt%aeUcY\QcS_cQccUQXtdJQU^:fQcY_^c:cd_cTURU^cUbce`_^UaeUUc	
fUbTQT%U_c c_^TU\d_T_\J_`UbdYU^dU%\ Ses^T_ ^_`eUTU^Q;eTQbQ\QSQecQTU\Q\\RUbdQT	
6b] Y^Q^Q4i Swi] _%cYU^T_ UcdU U, UcdQT_ TU, SQc_%UcSbd_bUc Qbj. Y^Q^Qc Ucds^_R\YMQT_c QXQR\Qb	
TU VĒ QYS_XULU~dU'''''''	`Q₩,,
GUSSYM^J >: ^SeQ^d_Q\QTUdUb] YQSYM^TU\Qf_\e^dQTU^\QcS_cQc aeUUcds^S_] `\UdQ] U^dU	
YTNOUU^dU\^\QfYcd\TU\Q] U^dU'''''''	`QW,.
GUSSYM^J ≯: ^SeQ^d_Q\Q^_SYM^TU\Q\\RUbdDTTU\Qf_\e^dDT%aeUS_^cdQU^\Q	
	`Q₩-)
GUSSYW^J >>>: ^SeQ^d_Q\Q\\RUbaQTTU\Qf_\e^dQTce`_^U%5_]`eUcd_cQd_T_''	
•	`Q₩
GUSSYW^≵'9U/Q8_^UhYW^TU_c QSd_c TU/Qf_/e^dQT S_^_c TYSdQT_c TU\U^dU^TY] YU^d_	
	`OW-0

Y

	@cTUNU^c_kUcTU\QT_Sdb^QQd] Y^Q^Q: ^SeQ^d_Q\Q\\RUbdQT%6WU^S\QA_kQ\%\bds'''''''	
	GUSSYw^>>> @0: bQ; _^Uc`_b\Q: aeU Q;We^_c`YU^cQ^aeU 6\S_^dbQb <u>/</u> TU cU^dYT_ S_] x^%	
	$\label{local_condition} ce`_^UbQaeUIQc S_cQc \ aeU c_^^USUcQbQc\% \ QcQcUbTYW_TU SeQaeYUbQlQRQYj \ Q_ \ \ \ \ QcUbTYW_TU SeQaeYUbQlQRQYj \ Q_ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ $	
	111111111111111111111111111111111111111	`QW*+1
	$ \hbox{GUSSYW} \not\ni ': c \ 8 _ \land V \ \hbox{bi} \ \ U \ Q \ c U \land \hbox{dT} _ \ S _] \ \ x \land \% \ \ \ \backslash Q \ \ \land _ S Y _ \land U \ \ \land Q \ \hbox{debQ,Uc TU \ } Q \ \ A \ \ Q \ \ Q \ \ A \ \ $	
	ce`_^Ub^USUcYTQT]_bQ,`QtQcUbS_^cYcdU^dUS_^U_WY_i \QSU^cebQ%bUS_]`U^cQi U,	
	SQcdW_ ''''	`QW*,+
	$ \hbox{GUSSYW} \ \ J \ \ ': \ \ ^SeQ^d \ \ QUcdQc \ \ _RZUSY \ \ ^Uc\%aeU \ \ UcdU \ \ UcaeU \ \ \ QTU \ B \ \ USUcYTQT \ F \ \ U^TU \ dc \ \ d \ \ T_c \setminus c \ \ \ $	
] UTY_c i Uc\eUtj_c`QbQUfYdQbU\TUGY^%_\Q_RdU^SW^TU\QfYbdeTi\QcQ^dYTQT%}Q^i`QbQ	
	$\label{eq:continuous} $$ \Upsilon W ^ b_ wcYd_4i \ aeU XQSU aeU _c X_] RbUc ^_] sc aeU] saeY Qc TU d'UbYQ: hdUbY_bUc TU aeU _c X] RbUc ^_] sc aeU] saeY Qc TU d'UbYQ: hdUbY_bUc TU aeU _c X] RbUc ^_] sc aeU] saeY Qc TU d'UbYQ: hdUbY_bUc TU aeU _c X] RbUc ^_] sc aeU] saeY Qc TU d'UbYQ: hdUbY_bUc TU aeU _c X] RbUc ^_] sc aeU] saeY Qc TU d'UbYQ: hdUbY_bUc TU aeU _c X] RbUc ^_] sc aeU] saeY Qc TU d'UbYQ: hdUbY_bUc TU aeU _c X] RbUc ^_] sc aeU] saeY Qc TU d'UbYQ: hdUbY_bUc TU aeU _c X] RbUc ^_] saeY Qc TU d'UbYQ: hdUbY_bUc TU _c X] RbUc ^_] saeY Qc TU d'UbYQC _c TU d'UbYQC _c X] RbUc ^_] saeY Qc TU d'UbYQC _c TU d'UbYQC _c TU _c X] RbUc ^_] saeY Qc TU _c X$	
]_bQ,i \QbU\YYW\^'''''	`QW*, 0
	$ GUSSYW^J >: ^SeQ^d QaeU Q_RZUSYW^S_^ddQTU QT_SdbY^QaeU cU XQ] Q^dU^YT_%aeU \\$	
		`QW*-*
	GUSSYM^J ≯: ^SeQ^d_Q/Q^USUCYTQT TU/Qf_/e^dQT TYFYQ'''''''	`QW*-,
q	T/5Uc'''''	`QW*-2
	q°T'SUTUF UVUBU^SYQc TU\Qc : cSbbaekQc''''''	`QW*-2
	@c`QQRbQci VbQcUc\QdrQc''''''	`QW*.*

@\\RUbdQT\TU\Qf_\e^dQT\: Tg\QbTc

@\\PUbatTTU\Qf_\e^dT : Tg QbTc

@\\RU6dTTU\Qf_\e^dT ?_^QXQ^: Tg Q5Tc

D6FH: >

: ^\Qc aeUcUUh`\YSQi cU: GH67@ 8:9C HnFA:BCGM8CG6G9>: F: BH: G DUbcU^USYU^cUQ\QA6H: F:6 TU, TY:Sebc DCGH: F:€F

GLESY1^>

$: ^SeQ^d_QQQ^QbbQU_QTU_Qf_e^dT'$

M`b\dQnd RcUtf %aeU\Qf \e^dQT #\chin ^n\wk^d' TU\tu\n\qquare \chin \seq\\Q] UndU\\\\U\\seq\\Q] UndU\\\\\U\\seq\\Q] @VQSeVdQTTUVQf \e^dQT%Uc aeUU\`TUV%U\`b\\SYYTUVQ]U^dV%_b\QaeUUc SQ`Qj TUU\UWX8e^QSd TU\Qf \e^dQTUc\ $] \ ''_1 \ _ \ aeU e^Q G_TU U \ USS \ '' \ _ TU U \ USS \ '' \ G \ 'U \ '' \ Q \ aeU \ Uc \ e^Q TU \ ''S \ '' \ ' U \ 'U \ G \ 'U \ '' \ 'U \ '' \ Q \ aeU \ Uc \ e^Q TU \ '' \ '' \ '' \ U' \ '' \ Q \ aeU \ Uc \ e^Q TU \ '' \ '' \ '' \ U' \ '' \ U' \ '' \ Q \ aeU \ Uc \ e^Q TU \ '' \ '' \ U' \$ QaeU, `_bU, SeQ, U, Q,] QQTaeYUdU%_bUJUSSYw^_ cU ^YLMQ%Lkdi S_^dU^d_S_^UJQ4Qe^aeU SdU_ aeU RQxdQS_^TUSYS%Lk QaeU, `_bU, SeQ.U,Q]QUXWU`baeUU^SQTQQSdTUf\e^dQTU^QRc\ed%Q]U^U\U\WUe^QScQU^\eVQbTU dbQ4cUUXWUQ\U^\eWQbTU U, `_cYdf__i U, ^UMQdf__cU UcdQR(USU^Q?dUc TU/Q] U^dU `_bce U,USSW/% cU U,YWU U, ^UMQdf_4i \Q] U^dU TU UNUSdeQbce U,USSW/ U^LCUSQc Uc`b`YQ] U^dUU, QSd TU/Qf /e^dQT3/Qf /e^dQTTUTUdUg YQbU^dU/ cT c%Lc e^QTUdUg YQ5W^f /e^dQbQ4`Ub Uc_Uc_] 't] aeU XQSUbe^QU\USS\W^ 9U] Q^UtQaeU` bSeQaeYUb^] RtUc aeU \\Q] Q] c U\ QSd TU \Qf \e^dQT\\Q U\USS\W^ % LUSXQ Q'T %Q`b RQSW/YTUCQ`b RQSW/YU, Wecd %QFUbc/W/QRbQ Q!XUSXQ Q!XQTUUUL) YQSW/YTUSSW/YI Q'T % b XYRYJ/T % f_\e^dQbQ]U^dU%UcSQTQfUj]sc`QbQQ5deQbTUVbjQUU5dfQ@S[U#\$TY5U3@Qf_\e^dQT^_cYWYW5Q_dbQS_cQcY__e^`_TUb_ $SQ (QSTQT `QtQ` kUNUMb _ U,UNMb; M%U^Q) `s WMQ Q^dUMY kMaeU TTSUB (QQ `QQRkQ` kUMMSU^T _ `QkUSU] UZ_b `QtQ Uh` kUcQbU, QSd_ TU/Q$ $f_{\text{e}^{0}} = \frac{1}{2} \text{ find } \frac{1}{2} \text{ for } \frac{1}{2} \text{ for } \frac{1}{2} \text{ find } \frac{1}{2} \text{ find$ `eUTUTUSYbaeUQWe^QfUj\ aeYUbU DUb U,UZUj`\ aeU] U^SY^Q%` `beURQaeU^ XQi ^YWe^Q dbQS cQU^U,aeUbUb%c^ $aeUc^{\prime\prime}_{1} \ 'U_{1} \ U^{\prime\prime}_{2} \ 'U_{2} \ U^{\prime\prime}_{3} \ 'QQU_{c} \ 'U_{2} \ 'C^{\prime\prime}_{1} \ U_{2} \ 'U_{2} \ 'U_{2}$] sc bJ | dQ:TU`bUNUbU^SYQ4`Ub dQUc e^UcVeUbj dQ^Y^]UTYQdTUcu] Y:] '@ cYMeYU^dUU\UWYT % `bUNUbU%GeQ^T e^X] RbU S_] _ U, V/^TU/Q] 'k'] Q Mce T'k' eUcd_c dQ, QdUbQSYw^U^ce SeUb` _ U^U,] _] U^d_ `bUcU^dU%uc _dbQS_cQaeU ce U,USSYw^_ `bUNKNU^T_dQ;QdUbQSKv^U^ce SeUb`_U^e^]_]U^d_dQ%_ce Wecd_]UZ_baeU/Q`QSYU^SQTUUNQ M9Y_cQcu_XQXUSX_i

@\\%Uadot TU\Qf_\e^dot ?_^QX\Q^^: Tg\Q\$Tc

UcdQR(USSW/Q^QdebQUjQXe)Q^Q%UAQjQUcdse^TQQe^SeUb`U^UcdQTQTUSeQTaeUUAQjQ`BUNUbbbi/QUUSSW^TUe^Uc/eUbj dQ^ Y`] UTQQQ_QddQSW\TU\SeUb`_%QQddQSW\Y\cdQ\ds\UQ\c\WeU B_ XQ_\QTQ] sc U\\Qc Q6SY_\Uc TU] Y] U\db\@eUi_ c_i S_\CS\U\dUTU] YU^ddQc SQ] Y^_%Y^_cw__] Y`BUNDBb_VQUNUSSYM^QddQftcTU] _] U^d_c ceSUcYf_c aeU ^_TURU XQRUbdQUc QddtQSY_^Uc TU] Y: cU^cQSY_^Uc $\label{thm:conditional} $$ U^d_c_4^2 - d_S^e_QUh^U_SQR_Q_S_S^e_QUh^U_SQR_Q_S_S^e_U^2_D_S = U^S_d_G_C^e_D_Uh^U_SQR_Q_S^e_U^2_B^e_U^2_D_S^e_D_Uh^U_SQR_Q_S^e_D_Uh^U_S^e_D_Uh^U_SQR_Q_S^e_D_Uh^U_S^e_D_Uh$ e^QdQ^* bulleu^SQY^] UTQQQ U^dQ%Qc cU^cQSY^Uci] fY] YU^d c XQSU^bUQ\TQT97UV b] QY^cdQ^ds^UQ% cebWu^S ^cdQ^dU] U^dU DUb ^ Uc $StSe^{C}dQ^SQcU^{f}dQ^{S}QcU^{f}dQ^{S}QcU^{f}dQ^{S}QcU^{f}dQ^{f}QU^{f}UU^{f}QU^{f}UU^{f}QU^{f}UU^{f}QU^{f}$ $\label{thmu_rdu_update} $$t\tuu_Rdu^0\tuv_U^T\tuv_T_`_bSeQae'ubuv_e'ui_i = aeu'_`tuvuu_V^T\tuv_U^T_`_bSeQae'ubuv_e'ui_i = aeu'_`tuvuu_V^T\tuv_U^T_`_bSeQae'ubuv_e'ui_i = aeu'_`tuvuu_V^T\tuv_U^T_`_bSeQae'ubuv_e'ui_i = aeu'_`tuvuu_V^T\tuv_U^T_`_bSeQae'ubuv_e'ui_i = aeu'_`tuvuu_V^T\tuv_U^T_`_bSeQae'ubuv_e'ui_i = aeu'_`tuvuu_V^T\tuv_U^T_`_bSeQae'ubuv_e'ui_i = aeu'_`tuvuu_V^T\tuv_U^T_\tuv_U^$ $Q` LUXU^TYT_$TU aeU cUQ \underline{d}Q\] U^dUU^f Q^' | 6cuaeU cYTYcd^WeY| _c SeYTQT_cQ\] U^dU \\ \downarrow c _RZU \underline{d} c `b_`Y_c TU \\ \downarrow c fQBY_c QSd_c TU \\ \backslash Qf_{e^2Q}TW^C \\ \downarrow fQ$ QQ`QLUSUb`_bUcdQ% S_cQccU] UZQ^dUc SQc_c %aeU $^-$ XQ: $^+$ YWe $^+$ QTYKUUL $^-$ SQU $^-$ dWL $^+$ QTEUU $^-$ LV $^-$ LVUULUSSY $^+$ TU $^-$ X $^-$ Q RUU $^-$ LV $^-$ LVUULUSSY $^-$ TU $^-$ X $^-$ QTEUU $^-$ LV $^-$ LVUULUSSY $^-$ TU $^-$ X $^-$ QTYKULU $^-$ SQU $^-$ LV $^-$ LV $^-$ LV $^-$ LV $^-$ LVUULUSSY $^-$ TU $^-$ X $^-$ QTYKULU $^-$ SQU $^-$ LV $^-$ L] UZ bWecd % UcdQbcQXtVUSX c S ^e^QS cQ% c ^\] \text{\text{t}} S ^ce T\text{\text{\text{t}}} eUcd c UcQS cQ D b\ dQ^d e^QSd TU\Qf \e^dQT cUUh`tUcQ `buxubu^%_Ys\yqsv/Q%eQaeYubuc\eUgj_vic\g_RQZ_ucqQsYbe/cqQYsQQbuxu^TYT_%TUaeUcuQq_qQjU^qUU^fQ^_'6cuaeUcyTcdYvie\j_c $SenTQT_cQ] \ U \land U \lor _c = RZU \lor _c \lor _b \lor _Y c \ TU \lor _c f QbY_c QSd_c \ TU \lor Qf \lor _e \land QT \lor _c f QQQ QUUSUb) \\ _b U c QS \lor _c U J UZQ \land U SQC_c \lor _e QU V QUUSUb) \\ _b U c QS \lor _c U J UZQ \land U SQC_c \lor _e QU V QUUSUb) \\ _b U c QS \lor _c U J UZQ \land U SQC C \lor _e QS \lor _e Q$ $ce \ TC^* \ eUcd \ c \ UcQS_cQ \ D_b/_ \ dQ^d \ e^QSd \ TU/Qf_e^dQT \ cUUn`UbcQS_] \ x^1 \ U^dU`_bce \ e^X_] \ RUU QWQTQR/UQ XQSUbTU \ ucdu] \ _T _ TU \ ucdu] \ _T _4i \ e^X_] \ RUU XQUUD \ AUCUUN \ UCQS_CQ \ D_b/_ \ dQ^d \ e^QSd \ TU/Qf_e^dQT \ cUUn`UbcQS_] \ x^1 \ U^dU`_bce \ e^X_] \ RUU QWQTQR/UQ XQSUbTU \ ucdu] \ _T _ TU \ ucdu] \ _T _4i \ e^X_] \ RUU XQUUD \ AUCUUN \ UCQS_CQ \ D_b/_ \ dQ^d \ e^QSd \ TU/Qf_e^dQT \ cuUn`UbcQS_] \ x^1 \ U^dU`_bce \ e^X_] \ RUU QWQTQR/UQ XQSUbTU \ ucdu] \ _T _ TU \ ucdu] \ _T _4i \ e^X_] \ RUU XQUUD \ AUCUUN \ UCQS_CQ \ D_b/_ \ dQ^d \ e^QSd \ U^QSUBTU \ UCQS_CQ \ D_b/_ \ dQ^d \ e^QSd \ U^QSUBTU \ UCQS_CQ \ D_b/_ \ dQ^d \ e^QSd \ U^QSUBTU \ UCQS_CQ \ D_b/_ \ dQ^d \ e^QSd \ U^QSUBTU \ UCQS_CQ \ D_b/_ \ dQ^d \ e^QSd \ U^QSUBTU \ UCQS_CQ \ D_b/_ \ dQ^d \ e^QSd \ U^QSUBTU \ UCQS_CQ \ D_b/_ \ dQ^d \ e^QSd \ U^QSUBTU \ UCQS_CQ \ D_b/_ \ dQ^d \ e^QSd \ U^QSUBTU \ UCQS_CQ \ D_b/_ \ dQ^d \ e^QSd \ U^QSD \ UCQS_CQ \ D_b/_ \ dQ^d \ e^QSd \ U^QSD \ UCQS_CQ \ D_b/_ \ dQ^d \ e^QSd \ U^QSD \ UCQS_CQ \ D_b/_ \ dQ^d \ e^QSd \ U^QSD \ UCQS_CQ \ UCQS_CQ$

@S[U#\$TYSU3@0f_\e^dQT Uc`Ub\USdQ] U^dUT\cd^WeUTU,TUcU_4aeUQ\Q] \text{\text{Y}} QQSS\\\^`eUTU\dU^Ub\dU^TU^SQ] ei Q,S_^ddQ_TU_ $aeU \land eUcdtQf_\ e \land tQf \land c \land aeU \land c \land tQf \land c \land tQf$ aeU%Q,] Y;] dt/] `aeUUcdiXQR\Q^T% ^\ TucUQ% eUTU`bUfQUSUbc RbUt\':^UcdUSQc %bc UfYTU^dU\Qf \e^dQTiU\TucU fQ^U^S_^dbQ_Ge`_^W_aeU_^_%aeUf_\e^dqTi_U,TUcU_c_^`QQRbQ;TU_UhQ6dg]_U^dU\Q]_Y;]_Qc%Y%%6Q5W^3_K_%_QbUSUcube^Q `QQRbQTUc%V%SQS%^]scWY^UbQ%aeUcUUhdW^TUQ\QcS_cQc`bUcU^dUciQecU^dUci.\TUcU_bUc`ubQQW_QecU^dUDeUTUaeU `bUMULQ]YcY&Q\$M^Q\$&Q,iVQ`_cœLQ%ce`_^WQ]_caeU`Ub]Q^U5UbcU^qQT_%_dU^Ub_c_Z_cQRYUbd_c%_b_aeU`eUTUaeUbUb_' DUb d TQfuQ^ `eUT `U^cQbaeU c ^dQ^S]`\UdQ] U^dUTYcd^d %aeU Q.We^QfUj cU`eUTUTUSY6S bbUsdQ] U^dUTYbU^S ^bdQil^ X_] RbJ ^e^SQ%J^ ^YWk^SQt_%BLcdQ] U^d_c SeQaeYbbS_cQS_^dbQbQQcec TUcU_c%_TUcU_c TUSeQaeYbS_cQU^S_^dbQTU ce f_\e^dQT':\UZU]`_Q^dUc]U^SY_^QT_%aeUU\GB@S[U`b_TeSU%KQi`beURQcTUaeUt_XQSU`DeUTUaeU%U^QWe^QS_^cYTUbQSW^ `WooeQTY6A`Uo_cY`U]RQbW_%cef_ke^dQTiU\TUcU_^_fQiQ^U^S_^ddQTUd_T_3_aeUaeYUbU%u\]Y:]_aeUt\TUcUQ4i^_aeUbUbe^Q S_cQ% U,TUCU_`_bU,S_^ddQb(_%U^^Y\Vk^`QddSe\Qb: ^UcdU SQc_%_ cU_RcUbf Q.S_^Se\TQT_%_ aeU Uc_ aeUbtT_% _ aeU Uc\Q S_cQTUcUQTQ8cY_veUtq%cUbQU^S_^dtqT_%aeUf_\e^^qQTi U\TUcU_ ^_ SX_SQ^^U^_] sc] u^\{ _\ @ aeUb\t_ U^\QWe^^Q $$$ \sim TUDQSW^*L `b_e^SQDQLL `QQRDQAI `GULTU = UW_QQ $$ $$ CTUDQSW^`b_e = UY'Vei UU^t VaeUt \^_TUDQQQ $$$ S_^ddQXQ4QV/^TUSeU^dQx%\U\XWUQ`b_^e^SQbdQUc`QQRbQx%__TUcU_TU^_`b_^e^SQbQc' M QcuS_]_Q_aeUU\Gb@_S[UXQR\Q TU/QV_tij QTUcUQTQ%QcQRUb EeU/Qc`QQRbQc%Qe^aeUdbU^TU^Q`UbceQTY%__TURU cUbUN5Q; `QxQU_%cef_\e^0T ^_ Uc S_^bbQb_ $QUcd_4aeU ^{aeV} LUCU = aeVUcU = aeVu$ U\TUcU `eUTU^Y6U^S ^dtQ%TURUTU] cdtQtcUaeUcUQ^e^ %Q\S ^dtQtY TU\Q dtQU^\Q] Y:] QS cQ% S ^bUc`USd Q\] Y:] _RZbd_TU\Qf_\e^dQT_U\TUcU_3`Ub_Qaeu_c_RZbd_cc_^T_c4iU^SQTQe^Q%d_]QTQ`_bcu]1c]_c%Qf_\e^dQTiU\TUcU_Ucds^TU QSeUbT_' M^_ Uc TU UnddQvQbaeU^_ TURU^`_^UbcUTU QSeUbT_ U^S_cQc TYKUbU^dUc%Qe^aeU S_^`_SQTYcdrWeYT_ U^ce ^QxebQQUj Q @gf_\e^dQT`eUTU^_ UcdQbTUQSeUBT_ S_^\Qf_\e^dQT%"YTUcU_ TUQSeUBT_ S_^U\,TUcU_%U^TYWUU^dUc S_cQc' 6\ \\\\\\] Yc] QYcdQ^SQaeUU\Gb

@\\RubattrTU\\Qf_\e^attr

GUSSYu^≯

: ^ SeQ^d_ Q\QTULU] Y^Q5Yu^TU\Qf_\e^dQT'

A UTYQYUU \QTUUUUI] YYQSYWYTU \Qf_\e^QQT%Y\Q \VQcU` eUTU eXIY QbS_^SeQaeYUbcXWYWSQT_%UVVQ`_b_RZUI_%GQecQYT_ aeU U, QSd_TU \Q f_\e^QQT_UUSSWYTURU cUbQcu% ^_TU_UQQ] QYUUQ4i \Qf_\e^QQT cUTYSU aeU cUTUUUI] YYU%eQYT_%6_] _ S_^cUSeUYSYQTU QW&YQ QSSWY%_YYVeUYSYQ%e UUSSWYCUTYSWWU Q% cUVXQY c_RUU e^_RZUI_`QudSe\Qb 8_] _ SeQYT_ XQR\Q] _c TU \QTUUUI] YYQSWYTU\] _fY] YUY_I \%_C UUVUY_C QCUbUY_e^QTYUUSSWYQV;VY\eVQBTU_du_'

D_b]_df_] U LLWUD_Q\Qd_dQ\TQTTU_aeUcU] eUfU\%LhS\dQ_Yf\dQQ\Q] U\duQf_\e^q\qT\%QcUQe^QS_cQ`_b
cU`QtQT_%_] eSXQcS_cQcS_^ze^Sdi'AeSXQcS_cQc`QddSe\QtLc`eUTU^TQbceS_^cU^df_\tu^d_\%e^\bcec\euti\Qc\%QtQ
YTES\b\Q] U\du\i SeQ^T_ UcQc\\d_T_cze^d_cc_^S_]_e^]_df_S_]`\UZ'MSeQ^T_XQR_TU\]_df_] sc\eutilu\tu\du\\d_T_aeU__`UbQ`QbQYTeS\be^TU\du\i YQT_Qsd_TU\f_\Sw^\%QcUQ\Q\eU\i QTU\e^Qc_\QS_cQ_
TU] eSX_cze^d_c'

@\\#Uadot \to\Qr_\e^dot \rightarrow\Qr_\e^dot \rightarrow\Qr\. Tg\QbTc

MSbJ_aeUdQ] RY:^TURUcUb`Ud] Ydf_ `_bd_T_c%aeUSQTQS_cQaeUcU\\Q] Q`b_`YQ] U^dUe^] _df_%J] _SW/%_Y*TeSSW^Q $e^Q`UbSU`SW^%QWU^dUf_{e}^dQbY_%dU^UQWk^dY_i WbQT_TUdU^TU^SQ%_e^QfU^dQQ`QbQ]_f Ub_UbSxdQbQf_{e}^dQT%_bUfYQ_e$ Q, WLGd_%_ U^ U, QGd_ TU \Qf_\e^dQT UhSYQT_' : cdQ dU^TU^SQ Q^dUb_bTU \Q] _df QGYw^ Uc _ aeU \\Q] _ \Q\\eUb; QTU,] _df _' :cU] df_aeUdU^Ue^]U^_bWkQT_TUfU^dQQQdubYb% \QdU^TU^SQQ]_fub\Qf_\e^dQT%_aeU`QtUSU]U^cQbQSdf_%dQ, iS_]_UcdsU^\QfYcdQTU\Q]U^dU%Uc_aeU\\Q]_e^]_dff_]scTtR\YD_bU\S_^ddQbY%_aeU`QduSU]scQddQSdf %adU^U% `_b_ aeU`QbusU aeUU^buQsw^Q\QS_]`bu^cw^_Q`buxU^cw^%u\]Q_bWtQT_TUdu^TU^SQQ^dubY_b`QtQuhsYtQbUY^TeSb $\V(U,USSW^{L} = aeU\V(Q) = U, Q) = M = 1$ sc $\V(U,USSW^{L} = aeU\V(Q) = aeU\V(Q) = M = 1$ sc $\V(U,USSW^{L} = aeU\V(Q) = aeU\V(Q) = aeU\V(Q) = 1$ sc $\V(U,USSW^{L} = aeU\V(Q) = aeU\V(Q) = aeU\V(Q) = 1$ sc $\V(U,USSW^{L} = aeU\V(Q) = aeU\V(Q) = aeU\V(Q) = 1$ sc $\V(U,USSW^{L} = aeU\V(Q) = aeU\V(Q) = aeU\V(Q) = 1$ sc $\V(U,USSW^{L} = aeU\V(Q) = aeU\V(Q) = aeU\V(Q) = 1$ sc $\V(U,USSW^{L} = aeU\V(Q) = aeU\V(Q) = 1$] off] sc \eUtatU 8 cQc aeUU\h\cdu^U^\Qf\cdQTU\Q] U^\dU\dU^\u^ce \eUti Q%U\TU^\SQ% e^QfU^\dQ\\Q\Q\Q\ [futaU\% UhStQbQcef_\e^dQT%TU] eSXQcS_cQcaeUS_LbUc`_^TQ^Q\Q^QdebQUjQi \QcSY5e^cdQ^SYQcTU_fYcd_%Q^QdebQUjQi SYSe^cdQ^SQcTU/Q]U^dUaeU/Qc `YYY^UciU,WKQT i/QVkjQTUce`e^dTUfYcdQ4TU/cSeQUcdQ,fUjcUbuQTWASY,XQSUb e^QU^e] UbQSW^`UbUEdQ DUb_dQ^d_Sbu_aeUcU`eUTUTUdUdYQbU^WU^UbQ%cY`Uc`QSY_`QbQ\QS_^db_fUbc\Q%aeUd_T__ aeUcU`Ub\$RU_TUbYT_`_be^QWU^dU\YdU\WW^dUif_\e^dQbQ%aeUdW^U\Q^QdebQ\UjQi\QYY\eU^\$QTUe^]_df_Qf_\e^dQT _UNUSSYM^%CUS_^cYTULQ_cUfUdQ^ReU^_4^YdU^UdU^TU^SYQQ`QbdSY`QbTU\QUNUSSYM^TU\Q]QU^e^WbQT_]Qi_bTU_aeU `QtUSU dQ\'DQtQTUSYb_TU_db_]_T_%cUbQTUSYb%aeU\Qx S_cQx aeU Q`QtUSU^%tU^U^e^QdU^TU^SQ%_b\QQ`QbSW^aeU $XQSU^*Q_Se`QbQ]\ U^*U`\ QtQUI/VMbQUI/_c\%TUQWe^*Q_dtQ]\ Q^*UtQaeU`_bce\ Q`QbSw^`UI/VMR/Uc`\ QtQUI/Q4aeU\ Uc\ QRcebT_'\ M$ `_b_dQ^d_TURU.cUbSYUbd_%J^SYUbd_cU^df_%eU/Qf_\e^dQT.cYU]`bU.Uc%5_]__U,]Q;_bRYU^Uc.UfYTU^dU_DUb_cw, %QtQ/Q. S LBUSQDS] `BUYCYW^TU Ucd %T c S cQc TURU^UcdQbRYU^i SYQDQ] U^dU RcUbf QT c'

 $\label{local_local_local_local_local_local} $$ U_{U}^{t}(U_{U}^{t})^{t} = aeU_{U}^{t}(U_{U}^{t})^{t} = aeU_{U}^{t}(U_{U}^{t})^{t}$

dtQdQT_ `_bcu] Y:] _% ^_ Uc ^USUcQYY `QtQ] Y` b_`wcYd' M_ `_b_ dQ^d_cw_] U^SY_^Qtr QWe^Qc S_cQc U^WU^UbQ\

>I ^QS_cQaeUXQSUaeUe^_RZUd_`b_`eUcd_Q\QU\USSW^TUQSeUbT_%UcUf`NTU^dU\Q^QdebQ\UjQi \Qc SYSe^cdQ^SYQcTU\
RZUd'MXQi fQbQcS_cQcTUUcdUd'_%aeUdU^U^Y\\eU^SQU^\Q`bUcdQS\w^TU_RZUd_]sc_]U^cC\WQTQR\U4S_]_%'
@ aeUQ`QbUSUU^U_RZUd_%XQSYL^T__XUdj_c_iQ\WQTQR\U%_TUV_bj_Ui]_\UcdQQ\Q]U^dU4fYL^T__S_]_UcU^cu
] Ycj_'

 $+ (@Q) (QU) \wedge U (QU) = (AU) + (AU) (AU) + (AU) (AU) + (AU) (AU) + (AU)$

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8_fllk* USd_QWiQT_TU\QYTUQ_Q' llx\UrcwnTu\'\QSLb\edb_' 8_fllk* USd_Q\Qc s_cqc aeUc__RZid_TU_eUcd_c' \urcq\cqqq\cqq\
'\CcqTQ% llx\Urd_may_ll_c] eSX_] sc TU e^Q\tau_Q' llx\UrcwnTu\\weather_s_cqc aeU_d_c4Uc TLot\%eUcd_c' \urcq\tau_qcq\qcq\
'\CcqTQ% llx\Urd_way_ll_c] eSX_] sc TU e^Q\tau_Q' llx\UrcwnTu\\weather_s_cqc aeU_d_c4Uc TLot\%eUcd_c' \urcq\tau_qcq\qcq\qcq\
'\CcqTQ% llx\Urd_way_ll_qway_se__1 sc Q\tau_q\tau_q\tau_ll_c \urcep_q\tau_Q' llx\UrcwnTu\qweather_s cqc aeU_d_c4Uc TLot\%eUcd_c' \urcq\tau_q\tau_ll_c \urcap_q\tau_q

i] _fub/Qf_/e^qTr 6X_kQuc] sc QWQTQR/UQ/Q] U^dvQdU^ubU, \QSUbTU_c SeQ\uc abu^ue^cu^atr_ \eubdui fY_%eUU,

TU_c aeUcw_ abu^ue^Qf QWQYTQR/UQ/Q] U^dv\QQdWeQcUQcYdWs_^U, Q`ubdi_] sc \eubdu% U\] Qi_b] Q\ucdbQcYcdUQ

\Q\QQQTUU/Q4i uc QWQTQR/UQ\Q] U^dv`QbQu\ubsym^TU\Q] U^dv\QWe^_c TUU_c Zej WQT_c S_] _] Q`_bbc% _db_c

\Bucu^aQ^Z*_d'c%_] _ S_] `Udf_bbc `QbQ\UUSS\m^TU\Q] U^dv\QWe^_c TUU_c Zej WQT_c S_] _] Q`_bbc% _db_c

] U^_c4\Q] U^dv\QQ RY_TQT aeU_db_C4i _c `\QSUbuc aeU Q`Qbbc\n^TU_g QWQTQR\UU^e^_TTU ucd_c Qc` Usd_c%) Qbusu^

] U^_c `_b_ aeUU^_db_c3U^`ucdu SQc_%d_TQc \Qc TU] sc S_cQc c_^YWeQuc%QQWQTQR\YTQT TU e^_RZbd_TU` b_`eUcdQTU

\U\USS\m^Cbbc \ Usb_ e^\Wq_T_Q\weq\under\Q\under

 $QWOTQRYNTQT_TUcQWOT_TUUcU_RZUd_4U, SQtsSdUb`QtdSeVQbaeUVQ]\ U^dUdU^U`_b^QdebQUj\ Q\%\ aeUcUXQY^db_TeSTT_i$ $\label{localization} $$\operatorname{UcdQR}(US)T_{\ \ b}(Q) = \operatorname{UcdQT}_aeUUcds \ U^{Q}_1 \ U^{d}UU^e^{Q}_2 \ QVW^{d}_1 \ U^{Q}_1 \ U^{d}UU^e^{Q}_2 \ QVW^{d}_2 \ U^{Q}_1 \ U^{d}UU^e^{Q}_2 \ QVW^{d}_2 \ U^{Q}_1 \ U^{d}U^{e}_2 \ U^{e}_2 \$ `QbdSe\Qb':cU RZUd aeU`QbUSUQSU`dQR\U`QbQe^%^ \ XQSUQ dbQ'MU,]Yc] RZUd ^ cYUj`buQ`QbUSU`b\WeQQQSU`dQR\U `QbQ\Q]Y:]Q`Utac ^Q%J^TNUUbU^dUc}] U^d c':c]scQWbQTQR\U`QbQQWe^ccX]RbUc%QcUWeYbcebQw^4i`QbQ abc%QbQ $cUMe'bcec Q'Udd_c3QQWe^c_cX_] \ RbLc\%lc] \ sc QSU \ dQR(U`QtQ \ 'UWQbe^QY'S)YQSW^f f'SY_cQ%aeU QcQdb'VQSUb_4_db_c \ aeU] \ UZbcU$ QTQ`dU`QtQCQtC\QSUb\ cQ`Ubtd c] $scfYtUc':c] scTUcQWQTQR\U`QtQ QWe^ cX] RbUc aeU U^ db c% QtQS ^btQbtUcdQbe^Q$ TNOUBLYOUG `UGC ^Qc4i ^ cw, Ucd %YY Q\Qc] Yc] Qc`Ubc ^Qc U^TNOUBLYOUG]] U^d c' DUb % c'R\U] U^dU%Uc ^USUcQbY] U^SY_^QbU\ UcdQT_TU\Q] U^dU;%6] _] _df_TU\Q QWbQTQR\\TQTTU_RZUd c T\cd^d c TU\ c _db_c T_c] U^SY_^QT_c Q^duc4 fURWWQSQ @Q^QublQUiQQ`Qdu^dui \QcSK5e^cdQ^SQcTU\ cRZUdcfYcdc% \Q]Q^UUQTU\QfYcdQ HQ\fUi%YUcdb6dQ U^dU $S \sim TUMQ c/Q Q dMQS c TWMW dW dW) WQ W d i U, UcdQT TU/Q W d <math>V \sim XQSU \sim VW d Q Q dMQS W \sim V S e Q d Q Q Q$ Q|QRYYTQTTU\c_RZUd_c%TU_dbQ|Q^UbQ%aeUiQaeUXQSUaeU\c_RZUd_cU^cu]Yc]_c%TU]Q^UbQTYKUbU^dURU_TUV_b]U% RUNUJ Q_TUV_bJ YTQT% \QSUb_T__b%QcUb] sc_] U^_cfY_'GY^U] RQ\$\(\frac{1}{2}\) Uc SYUbdQ%aeU\Qf_\Y\$\(\frac{1}{2}\) Y\\chi \Qtb\(\frac{1}{2}\) Y\\chi \Chi \Chi \Chi \R\(\frac{1}{2}\) \\ \frac{1}{2}\] $aeU`eUTU] U^SY^QbcU^Mc TU_db_]_T_aeUU,] Q_bRYU^Q QbU^dUUc^9TU |Q] Q^UbQaeU cU XQUh`\BQT_' @QUUSSW^TU |Q$] U^du ^e^SQ cU Q` QtdQTU_ aeU%U^ UcU] _] U^d_% S_^bUc` USd_Q_c _RZbd_c TVbUSd_c UY^] UTQd_c TUTUSY`W^% QtUSU] sc $QWQTQRUI: QWQTQRUI% _ ?cYTUtQ^*T_d_TQc_VQc_S_cQc' GY_c _RZtd_c Y^*] \ UTQd_c TU_VQf_Ve^2QT_c_^VQc^b_`YQc_QSSY_^Uc_TU_e^A C_RZtd_c Y^*] UTQd_c TU_VQf_Ve^2QT_c_^VQc^b_`YQc_QSSY_^Uc_TU_e^A C_RZtd_c Y^*] UTQd_c TU_VQf_Ve^2QT_c_^VQc^b_A C_RZtd_c Y^*] UTQd_c TU_VQf_Ve^2QT_C Y^*_A C_RZtd_c Y$ X_] RIUNYJ^d_^SUc.\Qc.QSSY_^Uc.aeU.Q`QUSU^] sc.QWfQTQR\U.aeU_aeU.aeU.aeU.d' GYUc.QX_bQ] sc.QWfQTQR\U`QtQt.\%Q\Y^_TU SeU^dQc%Q`YU%QS_^dY^eQ5W^%aeUQX_bQaeYbbUSQ|YYQbGYbcQX_bQ%_RbbU%d_dQMYQTTUV_aeUU^\QQsdeQMQTcu\UQQbbU%] sc QWQTQR(U`QxXQR)QbXkeUW_UXWWXQR)Qb4cY\US_^FYU^U] L\Zb`QkQ] Q^dU^UbU,cYU^SY_%U^d_SUc_`dQ`_bWeQbTQbcY\U^SY_' $6`U^C XQ e^T C XQ i] sc SQb_i] sc e^T U C Q_T U_C Q_T U_C Q_T U_C Q_T U_C Q_T U_C Q_T U_C X_I RUC Q_T U_C X$ $QSdkQ^TUV_b] Qf_e^dQbQ% XQSU^L aeU aeVbbV%I^d_SUc UV_c XQSU^L aeU] sc VUc S_fU^MQV_L aeU Uc] sc QMQTQR/U `QbQ `QbQ `QbQ C XQSU^L aeU Uc] sc QMQTQR/U `QbQ C XQSU^L AeU C$ U_c' 9 US\b%aeU XQ\NQ^_ aeU \Uc `\Q' SQ% Ub_ Qx^^_ _ Uc QSU' dQR\U` Q\Q U_c%Uc U\,] \c\;] _

@\\rundom \tu\\qf_\e^ndm ?__^QX\Q^: Tg QbTc

 $S_cQaeUTUStS@eUXQMQ^{_aeUaeYUtQ^%Ub_ ^_QSdkQ^Qce `QSUb4i UcTUSYS@eUXQMQ^{_aeUUc`QGSQi cY^U_RQbW_ ^_XQSU^{_aeUUc`QGSQi} SQi cY^U_RQbW_ ^_XQSU^{_aeUUc`QGSQi}$

GOWK_COLIC, RALL AND LANGE RICKOLZOO I N.S. ADDLINKI, FORE J. O. P. R. C. ROLL CARRANGE LANGE LANGE COLLONG AND LANGE LANGE COLLONG AND LANGE LANGE COLLONG AND LANGE LA

GUSSYı^≫

 $: ^{\text{LU}QSY_1}^{\text{S}_1} \text{LU}_{\text{C}}^{\text{MWYMSQT}_{\text{TU}}_{\text{C}}} \text{def} \text{ } Y_{\text{C}}^{\text{MQ}}^{\text{USU}_{\text{M}}} \text{ } TIN_{\text{C}}^{\text{MWYMSQT}_{\text{M}}} \text{ } Y_{\text{C}}^{\text{MQ}}^{\text{USU}_{\text{M}}} \text{ } Y_{\text{C}}^{\text{MQ}}^{\text{MWYMSQT}_{\text{M}}} \text{ } Y_{\text{C}}^{\text{MWYMSQT}_{\text{M}}} \text{ } Y_{\text{C}}^{\text{MQ}}^{\text{MWYMSQT}_{\text{M}}} \text{ } Y_{\text{C}}^{\text{MWYMSQT}_{\text{M}}} \text{ } Y_{\text{C}}^{\text{MWYMSQT}_{\text{$

 $\begin{array}{l} @ @ c \ QQR D C \ TUFU CUDTU \ SW TU aeU \ C \ C \ D I \ D C \ C \ QQR D C \ TUFU \ C \ D I \ D C \ C \ D I \ D C \ C \ QQR D C \ D I \ D I \ D C \ C \ D I \ D$

*' @c S_cQc cUTYSU aeU c_^^\SUcQbY_c U^WU^UbQ\@eU Ucds^_ UcdQbs^Q` UcQbTU SeQaeYUb_`_cYSW^ce``_cQR\U_`_cYSW^U^U\ fU^WQ Dub_ \Qc S_cQc cUTYSU aeU c_^^\SUcQbQc` QbQ^_c_db_c\@eU Ucds^_ UcdQbs^Q` UcQbTU d_T_ ce``_cQR\U_`_cYSW^U^U\ SQc_TU_^c_db_c' @_] 'k'] _ cU`eUTU_RcUbf QbTU \Q`QQRbQ\f\ `_cYR\U%_db_c dQUc dt bj Y^_c cUj UbQYdbc'

 $+ : c\underline{d} \cdot c \cdot d \cdot b \cdot | Y_c \cdot v_c \cdot v$

, '8_] _ \Q`\QQRIQ`\USUKTQTWI\^ce ec_fe\Wbi S_] x^%Lk LNQIf_% cYI]`\BIXQSUBUNUKUYSQQSYUBQ_`_c\SWYYce\WSYYUYI]\QMYQRIU_b_
aeUSeQT_XQRQI_cTUQW_dQ^\USUKQIY_\QQ_c_d_c\dc\S_\BIQSW\QSYUBQ_`_c\SWYCe\`_c\GR\UTU^e\LdQf_\e^\QG\Qe\UTU_d\SeQae\Ub_
do] _T_ aeUQ] UTTQaeUcU_`_\U\TU\\dig\G_\e^\ddyQ\@&c_d_c\dc\C\TSU\aeUT\\BU\\c\SY\\Qe\UT\\dig\G_\e\\ddy_\O\\dig\G_\e\\ddy_\o\\dig\G_\e\\dig\G\dig\G\dig\G\dig\G\\dig\G\\dig\G\\dig\G\\dig\G\\dig\G\\dig\G\\dig\G\\dig\G\\dig\G\\dig\G\dig\G\dig\G\\dig\G\\dig\G\\dig\G\\dig\G\dig\G\dig\G\dig\G\\dig\G\dig\G\dig\G\dig\G\dig\G\\dig\G\\dig\G\dig\G\dig\G\dig\G\dig\G\dig\G\\dig\G\\dig\G\di

@\\ruadot tu\qf_\e^dot ?_^QXQ^: Tg QbTc

- 'GUTUC' BUTUTUL_ aeUcUXQ_RcUtfQT_%aeUSeQT_ Ucd_c dtij Y_c Uc "USUcdy" %] '_cYRUNBBUCYGRUNYSQ Q % S cUedky QUY_c SQc_c
UYT_YTU__f_ke^ddt YceNbtu^du cuce`_ 'Uw_' 'eUtuce`_ 'UdcU% Ub_'Q 'b_'YQ YdebQuj QTU\Q 'b_'YQce' eUcd_SQc_UhSei USeQaeYub
_'_CBWY%Ubs%_ UcVeUtj_4U^d_YSuc__ cuedky Q^UY_ce CWYMbQT_ 'b_'YQ' YdebQuj QTU\Q 'b_'YQce' eUcd_SQc_UhSei USeQaeYub
'C ecQcY^cUYdT%_ UYQWk^cUYdT_^eUt__%TWUBUYUTU ce cWYMbQT__BWYQ i QTUSeQTQ 8_]_ '_buzuj '_4cYQWe^_TURUQWd QbTUUcdQ
'C ecQcY^cUYdT%_ UYQWk^cUYdT_^eUt__%TWUBUYUTU ce cWYMbQT__BWYQ i QTUSeQTQ 8_]_ '_buzuj '_4cYQWe^_TURUQWd QbTUUcdQ
'C ecQcY^cUYdT%_ UYQWk^cUYdT__eUt__%TWUBUYUTU ce cWYMbQT__BWYQ i QTUSeQTQ 8_]_ '_buzuj '_4cYQWe^_TURUQWd QbTUUcdQ
'C ecQcY^cUYdT%_ UYQWk^cUYdT__eUt__%TWUBUYUTU ce cWYMbQT__BWYQ i QTUSeQTQ 8_]_ '_buzuj '_4cYQWe^_TURUQWd QbTUUcdQ
'C ecQcY^cUYdT%_ UYQWc^cUYdT__eUt__%TWUBUYUTU ce cWYMbQT__BWYQ i QTUSeQTQ 8_]_ '_buzuj '_4cYQWe^_TURUQWd QbTUUcdQ
'C ecQcY^cUYdT%_ UYQWc^cUYdf__AeUt__%TWUBUYUTU ce cWYMbQT__BWYQ i QTUSeQTQ 8_]_ '_buzuj '_4cYQWe^_TURUQWd QbTUUcdQ
_'C exQcY^cUYdT__% UYQWc^cUYdf__AeUt__%TWUBUYUTU ce cWYMbQU TUL_dtaQc UTQ aeUYQaeUYQaeUTURUDQ UYUUcdQ '_cWr^AeUt__cUYdT__WMUBUYUTU ce ec__S]_XY4aeUUc S__hubuUySQ6_]_ cUXQ_RCUUf__%Qce_'C_cSWY] & GCUQS__\QYCYXWMbQYSQX6_UYQWc^aeUT__cUYdT__%TWUBUYUTU ce ec__S]_XY4aeUUc S__cB_UUQWQ_S_cQ8'QdQU, SQc_ce'eUcd_Uc \QTTUUcdQTYC'eUcd_C%_\QUUSSWY ce'\'cQR\UQ\Q__'CSWYMQQTUT__ke'QDT%_\QUUSSWY ce'\'cQR\UQ\QUUSSW

BUSUC'NTQT] $UdQuc'S_ W_C cwwS_ Uc ^QTQTWUSU'dU TU ce SUbdUj Q B_ XQR_ QX_ LQTU QSUbdUj QTU, S_^Sij YU'd_%_QaeUUc U, Ve^TQJ U'd_ TU QSUbdUj QTU, S_^Sij YU'd_%_QaeUUQ U^QaeU cU U SeU'dbQ/Q `\Q^aQTU \QY^Q\R\NTQT TU \Q `b_ `_cYSW^aeU_c QwGJ Q$

@ aeU cUTQQfUSU: S_{-} QTUVYSWATU ^USU: SYOT W_cw\SQ\QcQRU\%QaeU_`_b_ aeU e^QS_cQ^_`eUTUTUZ\pTU cUtq\%_ SeQ'T_`_bU\Q^_`eUTUCUbTU_ddQ] Q'UtQ\%\Q\QTU cUbe^QUh`\\SQS\W^QTUSeQTQTU\Q] \tildoonus Q\cdot_\

@\\ruadot \tau\color \tau\color \e^a\dot \rangle \rangle \dot \tau \rangle \rangle \rangle \rangle \tau \rangle \rangl

 $SeQaeYLbS_cQ%eQaeYLbQTUV_c`bYSYY_c%QSQXTQTY&Sed_SYSe^cdQ^SQXdDYUV^e^QS_1`VLbQi 8CB: L *B 8 *FHC% \\ QS_^dYeQSWY%QUhYcdV^SQ_cUbTUULcQS_cQcUTYSU aeUULc ^USULcQbY_UV^e^cU^dYT_1 UdQx6YS_' MU^LLcdU cU^dYT_ aeUedXY_\Q`QQRbQ ^USULYTQT%\U\U\TYS=bc_c\WeYU^dUySeQ^T_1 UULYeUbj_`QbQTU]_cddQbaeU\Q^USULYTQT ^_Uc YS_1 `QdR\US_^\Q\RUbdQT'$

 $: \ceZUd_i U, `bUTSQT_TUe^Q`b_`_cYSW^aeUQWd] Q/QUhYcdU^SQTUQW_% eUTU^dU^Ube^S_] `\Ud_%WZ_% SYUbd_c S_^UhW^TUfQbQc] Q`UbQc'$

 $\#$DeUTU^dU^Ube^QS_^Uh^w^S_] `\UdQi `UbUSdQU^cu] \ Yc] \ Qc4`_baeU`eUTU^i] `\VSQbe^QS_^ddQT^SS'w^%_ QRcebT_ Rbed_% QtQI \ Yc] \ Qc4`_baeU`eUTU^i] `\VSQbe^QS_^ddQT^SS'w^%_ QRcebT_ Rbed_% QtQI \ Yc] \ Yc] \ Qc4`_baeU`eUTU^i] `\VSQbe^QS_^ddQT^SS'w^%_ QRcebT_ Rbed_% QtQI \ Yc] \$ $\label{eq:cecond} $\operatorname{ce'}_{\boldsymbol{Q}} = \operatorname{Col}_{\boldsymbol{Q}} = \operatorname{Col}_{\boldsymbol$ S ^c\TUbQT ` b\ \WU^UbQ\%\Lc ^USUcQbY U^cu] \cdot] 3` baeUcUbQU^cu] \cdot] U,] Q bQRcebT \%'U\WQb\QUh\cdu'\S\QTU\cUb\U^ $\verb|cub| = \verb|cdQT_cYUcdU_VeUQe^| eQTUSeQT_QUU_U | 6 cuaeUU, YW^d_U = \verb|TU9Y_ci_do_cQtMRed_cc_^^USUcQY_c'D_bV_aeUUcdu_U | 6 cuaeUUcdu_U | 6 cuaeUu$ ^USUCQYY U^ce`b`YQ^QdebQUj Q%aeUT ciT cTURU^cUbTU SeQdb 4i Uc ^USUCQYY aeU dTQc\Qc\uruVcTU\QTUbUSXQddQj QTQc TUCTU U, SU^db TU e^Subse\ Q\QSYSe^VUBU^SQTURU^cUbYWeQUc': c ^USUcQY %U^V b] Qi QTUSeQT %aeU\ c X] RbUc TURU^ $XQSUbQ \setminus cTU] \ sc\% \] \ \setminus \ XQbQ^aeUTURU^XQSUb^ \setminus QbQU \setminus c' \ 6cuY^e] \ UbQR \setminus c \ UbQR \setminus c' \ 0cuY^e \ UbQR$ ^USUCQBY_c U^cu] Yc] _c3U, ceZtd_i U,`bUTSQT_ TU/Q`b_`_cY5W^aeUU/_c QXb] Q^%Lcds^`UbUSdQ] U^dU S_^USdQT_c TU cu] ½]_c'#\\$@S_^Um\^TU\ceZUd_i U\`bUm\$QT_TUe^Q`b_`_c\\$\%eeUQ\b[Q\QUm\cdu^\$QTUQ\\\%eUTU\\\\@culicu\\\beta `_baeU\QUhYcUrSQTUUcQS_cQiQcU`b_SUTUQ`QcQb4i%_RYU^QX_bQUc%_XQcYT_4i_dQ|RYL^_XQXUSX_%_bQcuTUSYb_%cU] UTY CUBXUSX SYUbd i ^USUCQXQ) U^dUi YQbUbQRUI U^dUfUbTQT4U,UFU^d `QcQT XQVXQT i TUSYTWQ] QdUbQXU^SeQ^d Qce Uh'xdu^SQ4i XQXUSX_aeU cUQ'jj`_cYR\U%Y^_aeU \QUh'xdu^SQTURU cUbf UbTQTUbQj_U^du`bUh'SQTUt\'6ci%QUh'xdu^SQTU_aeU $iQcUXQ/UWQT_Q`QcQsQx_kQcUS_^fYbbdb^U^^USbbcQbQc4cUfQXQSYb^T_Y_i`_cYR_UaeUTURbbQcbb_S_^dbQb'_TU_SYbbd_%aeU$ $dQ_1S_cQXQcYT_1$

#'\$: \ceZUd_i U\`BUTYSQT_TU e^Q`b_`_cYSW^aeU QXM_QaeU QW_Uc% eUTU^dU^Ube^QS_^UhW^BUQ\i SYUdd_U^ \$_^cUSeU^SQAi Qcu`eUTU cUb^USUcQbY_%_bqQ^d_\QUhYcdU^SQTU\QS_cQAi QaeU`eUTU cUbcUWBBQi RYU^S_^USdQT_S_^ _ddQS_cQ%_aeU cU ^USUcYdQU^e^QTU\Qc Q^dWeQc Qc`USd_c' 8_] _ cU i QcUQd_dQ\i S_] `\UdQ] U^dUS_^USdQT_S_^\ aeU UCQR_\edQ] U^dU ^USUCYdQU ^e^QTU\Qc Q^dWeQc Qc`USd_c' 8_] _ cU i QcUQd_dQ\i S_] `\UdQ] U^dUS_^USdQT_S_^\ aeU *USUCYTQT cU U^SEU^ddQU ^w_c U`eUTU Uh`\YSQb`_b\QS_^UhW^TUT_c_] sc`b_`_cYSY_^Uc U^ddU cu\S&@c S_cQc aeU *USUCYTQT cU U^SEU^ddQU ^w_c U`eUTU Uh`\YSQb`_b\QS_^UhW^TUT_c_] sc`b_`_cYSY_^Uc U^ddU cu\S&@c S_cQc aeU *USUCYTQT cU U^SEU^ddQU ^w_c U`eUTU Uh`\YSQb`_b\QS_^UhW^TUT_c_] sc`b_`_cYSY_^Uc U^ddU cu\S&@c S_cQc aeU *USUCYTQT cU U^SUCYQT_C S_^_ddQc S_cQc aeU c_^^USUCQbQc%c_^^USUCQbY_c Qcu] Yc] _c%_be^Q^USUCYTQT TU *II' bdQ^SQQ

MQaeucU`eUTU_RcUtfQt%aeUd_TQt.\Qt.S_cQt aeUc_^U\\edeb_%_aeUU^_ceSUtY_cUS_] YU^j Q^QcUt%_aeU`eUTUTUSYtcUaeU

Ut ^USUtcQtY_%_^UbcQtY_c cw_U^UcdQx\dij QV_bij Q Ge UhYdU^SQ^_Ut ^USUtcQtQU^cu] Y:] Qti_baeUcYUt Qtv\ull_ccYui] Y: bu XQ^

UhYddT_' HQi `_S_ cU XQfeUd_ ^USUtcQtQce UhYdU^SQQ, cUbi Q\\UMQbQ`QtQt D_b_ dQ^d_%Qx^6Q] Q^UtQTU aeU SeQaeYUbS_cQ

aeUUtcds `_bfU^bQ` QtQbTUQaeuU^QTUQ^dUUt__`eUTUCUb^USUtcQtQ%Uk'_be^QS_^UhW^S_^Qw_aeUUt_~USUtcQtY_U^ce` b_`YQ

^QtbQUij Q%_QW_aeUi QUtc%_XQcYf_4TU] Q^UbQaeUU, aeUUtcds cYU^T_ ce`eUtcQtj U^du\Q_dQTeTQV__g c'8MUtcd_dQi RYt^Uc \Q

x^6Q] Q^UtQTUaeUd_TQt.\Qt S_cQt_TU\^Qt S_cQt_TU\^Qt SYW^TUQaeU\\Qt aeUUtQ^TUaeU\UQ^TU

@\\Rubattr TU\Qf_le^attr = \frac{\pi}{2} \fr

Udub^YTQT%_TbuQcub^UsucQbY_Q^ducTUaeUfU^WQ^Q`QcQb4i`_b_dQ^d_\Qx^YSQ]Q^UbQU^\QaeUSeQaeYbbU\Usd__UfU^d_%_SeQaeYbbU\Usd__UfU^d_%_Q\QbUb^YTQT aeU`Udub^UsUuc`UsQQ]U^duQ\QcS_^db_fUbcYccQsd_cTU\QcUb^UsUcQbQ]U^du_M`_b_dQ^d_UcdQuc\Q^UsUcYTQT aeU`Udub^UsUuc`UsQQ]U^duQ\QcS_^db_fUbcYccQsUbQTU_cQsd_cTU\Qf_f\e^dQT

I \nitudia \alpha \quad \quad

 $: cdQc S_cQc `eUTU^cUbceWSNU^dUc `QtQ_\Q_Uh` \\SQSW^TU_c dtb] Y_c ^USUcQtY_c i \ Q_USUcYTQT%_] _ dtb] Y_c TU QtdU% dQ^Q \\] U^eT_edNYQT_ `_b_c] UtQVdcYS_c% _c UcStd_Ubuc `_\text{t}] YS_c U^\Q_TYYYTQT%U^e^cU^3T_TWUBU^dU TU%] sc UhdU^c_aeU%Q \\ ce cU^dT_ bWN^Q_\%U^S_] x^\U^WeQ\aeU VeU Q^dUc Uh` \\SQT '$

@ aeUcUXQTYSX_`QQQ]_cddQbU\c\WYWSQT_TU\cdtb]\Y_c \dtb]\Y_c \USUc\YQY_c i \Q \USUc\YQT\% eUTUcUbce\WSU\du\Q\QUh`\\SQS\W^TU_c \dtb]\Y_c \USUc\YQY_c i \Q \USUc\YQT\% eUTUcUbce\WSU\du\Q\QUh`\\SQS\W^TU_c \dtb]\Y_c \d

@] 'k'] _ cU`eUTU_RcUbf QbQSUbSQTU\Qc`QQRbQc YSQ`QSUb UYSQ`QSTQT' GUXQ_RcUbf QT_aeU Ucd_c dblj Y_c%u^ce ec__ _bkwrQ,i S_] x^%bu^u^bb\QSw^S_^U,aeUbbS_] _ U, Uc\eUbj_%5_] _ U^U, SQc_\j QwrQR\U% S_] _ Yce\bSu^d U`QQ\QYdbb_c'\Sw^ `QcUQ_aeUbbT_i `b_SebQT_'DUb_S_] _ Ucd_c dblj Y_c cUedkj Q^U) U^eT_ `_b_c \kwc_Vc i dbw_w_c%uc`USQJ U^du_c UcSbd_bbc TUS_^db_f Ubc\Qc c_Rbu U,\Rbu QRUTbi_%aeU cUedkj Q^U^e^cU^df_] ei TkWbu^dui] eSX_] sc Qj `\Q% cUQ\Yd\c] eSX_c SQc_c U^T_^TUXQi f_\e^dT_ Uc\eUblij_ `QpQ\QYdbb_c'\Sw^TU\QS_cQ`Qc\Qb\U_`eUTU cUbce`eUcdQ @\\ruadot τ∪\Qf_\e^dot ?__^QX\Q^: Tg QbTc

GUSSYu^}'

9U\QTY6dYSYU^TU\Q^USUCYFQF ^QdebQ,i]_bQ% \QYYSQ QSYFQF

 $\label{eq:control_control} $$: cQ^USUC^TQT = CUSUC^TQU/WU^USUC^TQT - CUSUC^TQT - CUSUC^$

 $B_f_i \ Qc_`_bd(bQX_bQQ) \ bUWe^d(bcYUcdQTYcdYSW^cUQe^QTYcdYSW^`b_`YQi `UbUSdQA`Ub_cw_cU_Uh`\YSQbs Swi_cUUh^YQCWeYUYU^Ucd_cT_cdY_cTU^USUcYTQT% QaeU_cdbij Y^_ccUed(YQ^QfUSUc% iQaeUcUed(YQ^U^\QcYWeYUYUUTUYUCd_cT_cdY_cYWeYUYUUUTCSebc'$

 $\label{thm:conditional conditional cond$

@\\RUadTTU\Qf_\e^dT ?_^QXQ^: Tg\Q5Tc

 $aeUfU^{c}RZUdc`bUcU^{d}T_cQ^{d}U_{c}U^{e}Q^{e}jSQdQ%eQ^{T}_cUQRbU^{c}_Zc3_aeUQcU^{d}l^{u}d_Q^{f}UdTQTTUSUbdQc\\ `b_`_cYSY_^Uc%dQ^`b_^d_S_]__{c}d_bl_Y^{c}c_^U^{d}UTT_c4S_]_aeUT_ci_T_cc_^SeQdb_%eUU_^UMb_^__U_C_RQ^{S}_%eUT_c_WUQc\\ `QbQUQc`eUTUe^__^e^SQSbej__db_4QcuaeU`_bl_cwbWQ^__c^QbQUcTU_cX_]RbucQ]_fUbcUXQSQQRQZ_TU^USUCTQT%eQ^{T}_^_XQ_QQ_C_CU`eUTU^^__QbUU^BUQSW^S_^UcT_cd_cT_cd'_cTU^USUCTQT'$

*' ^LSLCYTQT]_ LQ, 'eUTU cUbdQ^QRc_\eQS_]_ \Q ^USLCYTQT ^QabQ\': c TUSYM\ UVUSd_`eUTU cUbdQ^`Ub\LSQ\' C SQc_C

S_^LSQT_ S_^ce SQecQ]_ LQ\%_]_ e^UVUSd_ ^QabQ\ Uc ^USLCQY_S_^ce SQecQ^QabQ\'GYQf_\e^QT U^d_T_c_c SQc_C

LCd_TUdUd_YQTQ ^USLCQXQ_U U^U__bU\]_ df__] sc \\eudul\%_cYQf_\e^QT ^e^SQXQSU ^YW\^df__TUBLC\\extraceSQcQ_Q\

]_df__%Y^e^SQ\`eUTU__`_^UccUQ\Q\ bucU^UYS\YQSW^] sc \\eudul\%_cYQf_\e^QT TURU cUbS_^d_f_UddTQ\(\textrace\) U_c e^__Y\

aeU ^YW\^__`eoTU ^UWQ\\& U_b aeU_Q\\eq_CSQc_c\\end{\certain} \end{\certain} \eq_CU\\\eq_CSQc_c\\end{\certain} \eq_CU\\\eq_C\\end{\certain} \eq_C\\eq_C\\end{\certain} \eq_C\\eq_C\\eq_C\\end{\certain} \eq_C\\eq_C\\eq_C\\end{\certain} \eq_C\\eq\

@\\ruadot tu\qf_\e^dot ?_^QXQ^: Tg QbTc

rcdb/rell_n_, crowdolinn/lo2] - crondoddoline, brell_n] til_nnd_qdd innoveral_innoveral_nnoverann, pf eend, drendfocchall_croudled

Licharder D Prr = crondoddoline, brell_n] til_nnd_qdd innoveral_innoveral_nnoverann, pf eend, drendfocchall_croudled

Lo2] x_l nand/dc 2 cdx, noberal_2 - f eeng innoveral_innoveral_nnoveral_nnoveral_nnoverann, pf

Cxcn qdddoline, brell_nnoveral_annoverann, pf eend, drendfor croudled innoveral_annoveral_nor_crownoveral_anno

, ': c `kUSt_ cUvQQbaeU%U^_ aeU cU XQ Uh`\/SQT_%_] _ YTYSQ U\ ^_] RtU TU\Q ^USUcYTQT] _ bQ%Q `QQRbQ ^USUcYTQT ^_ cU edky`QTU QSeUbT_ S_^U\ TYLV__bkWYQ\i U\ cYkV*WSQT_ TU\Q `QQRbQ% _baeU%_] _ cU _ RcUbf wQ^dUc%TYSX_c dt bj Y_c%Uc ^USUcQbY_%j `_cYR\U%tbucYcdR\U% S' U^U\\\U^WeQtUS_] x^% ce cU^dtT_] sc `b_`Y_%c_^cYU] `kU kUQbf_c4XQSYU^T_ kUVUbU^SYQQSYUbdQ_`_cYSYW^f_\e^dQbQce``_cQR\U_ UcVeUbj_%Uc YceWSYU^dU DUb_ ^_XQi dQ_`_cYSYW^g \Qf_\e^dQT i U\ UcVeUbj_ S_^dbQbY_%Uc Yj QWYQR\U U^U\ SQc_ TU ^USUcYTQT] _ bQ4aeU Uc e^QSUbdUj QTU\QYYSYYQSYW^i \Qf_\e^dQT] Ycj Q4aeU ^_QT] Yd\Qce`_cYSYW^TU e^Qf_\e^dQT `QtQ_`_^UbcU^dU UUSSYW^3 Ucce_CSd_` bUcU^dU4_\Q` bucU^dU UUSSYW^TU cUb_`eUcdQQ i bucYdb` bucU^dU UUSSYW^3

DQ&QTQbQWe^_c UZJ] `_c TUUXUbQc__`_bibe^nTQTUc i

DQ&QTQbQWe^_c UZJ] `_c TUUXUb\>QRYM1'&] _bQ, I \Q] eZUbTUWXQ^X_^_bi \QSQcdTQT` eUTUcUb\YSQ`Q; TU] QxQbQce `QTbU'I ^
X_] RbU] ei \QcSY`Q%U^U,SQc_TUS\UxdCc__`_bibe^nTQTUc i

@\\RUbdOTTU\Qf_\e^dOT ?_^Q\$KQ^^: Tg Q\$Tc

dundosy_nuc% uniquecinosque i doluc istratossy_nuc% eutunicuthyso; Qsuc tu Qredundacutu widawsqbee (ezeboq i nr_badosy_nuc% uniquecy) qj tu uzubsubosaje runtf_(e Qenunuj winige Qt tucu_tuce) bje; ubitotaevinoj nc two ce ucaj qi quusaj xsryj tu votabetiki enqaj widt_tu controj qovo, eutunisquenoj estaviti enqaj qovo, eutunisquenoj estaviti enqaj qovo, eutunisquenoj estaviti enqaj qovo, eutunisquenoj enqaj qovo, eutunisquenoj quenoj enqaj qovo, eutunisquenoj quenoj enqaj qovo, enqaj quenoj enqaj qovo, enqaj qovo enqaj qovo

6aeu`eUTU cUbTU ed(YTQT`QbQ_RcUbTQbUcdQTCdA'SW^TU\QYSQ`QSYTQT]_bQ%QcQRUbTUQaeU_aeUUcWUcQiiXQRY&eQ%i_aeUUc `QbdSe(Qbi_SQcY_Q\'D_be^QY^SQ`QSTQT]_bQ,Wb^ubQ,iXQRXdeQ;%|UbUWDb_Qe^QY^SQ`QSTQTU^U,\S_bQ;w^TU_d_T_c_cUbUbSE_c_Q&d_cTU f_ke^dQTTUUcUdY_%QddQftcTUUe^QY^S\YQSW^WRQiXQRY&Q%_e^XQRY&eQiTUSQQwTUVLSd__WQdQTUe^SYUbd_dY_TUY^S\YQSW^Gcu%e^ X_1 RbU] ei] Q_1 SQbs Sdub `eUTU cUb YSQ` Q_1 TU UZUBSUb dQUc QSd_c TU RU $^{\prime\prime}$ U'_SQXS_] _ _ db_%eU Ucds \\U^_ TU ReU $^{\prime\prime}$ Q $^{\prime\prime}$ QbbQUj QXS_] $X^{\prime\prime}$ U'\dU UZDBSU4i e^X] RBUSei S kQ w^uc XQRXbeQ] U^dUfQSu TUQWKQTUSIJ YU'd % eUTUcUbYSQ`Q; TUUZDBSUbQSd c TUQWKQTUSIJ YU'd 'QdbQft c TU $\label{eq:local_transform} \text{ULUTUNUSd}_{\text{L}} \text{TUB}_{\text{Q}} \text{VGT}_{\text{L}} \text{VG}_{\text{V}} \text{VAWQTUST}_{\text{L}} \text{D}_{\text{D}} \text{VAWSD}_{\text{L}} \text{VSQ}_{\text{VSQ}} \text{VSQ}_{\text{QSH}} \text{QT}_{\text{L}} \text{U}_{\text{L}} \text{VSQ}_{\text{L}} \text{VS$ $S_{EQ} \text{ w}^Q = QSd_^QSd_^QddSeQdSeQdSeCTU/QVeUG_Q_TUUSd_TU]_df_c^`BUCU^dUS_^TUUcd] = \{_c^`BUCU^dQT_c_QVQfYcdQTU/QS_]^`BU^cYW^9U^- \}$ $\label{eq:local_$ $]_\text{df}_\text{aeU}\text{dt}\text{U}\text{Q}\text{V}_\text{bg}\text{\&g}_\text{childer}\text{f}_\text{d}\text{TQc.}\text{Qc}\text{S}_\text{cqc}\text{MQ}]\text{Qi}_\text{bf}\text{U}^\text{d}\text{d}\text{d}\text{Qc}\text{V}\text{TeShb}\text{U}\text{NQ}\text{\&.}\text{V}\text{bh}\text{I}\text{Ub}_\text{TU}\text{U}\text{cd}\text{c}\text{d}^\text{c}\text{c}\text{TU}\text{Y}\text{XQR}\text{M}\text{TQT}]}_\text{LQi}\text{aeU}\text{cU}$ $\label{eq:continuity} $$ \|Q\| Q S_1 \times^1 \|^2 bU ^2 \|_{bU}^2 \|_{C^\infty} CS^TQT4'_baeU ^2 QQRbQ%U^ce c'M'NKBQT_1 sc b_Y i_bMN^2%W^UU BUQS'M^S_^QWK^TUVBS_U^2 BUQS'M^S_V^2 BUQS'M^S_$ YTNSQT_'MUcd_cU_RdD/Uc_RbUd_T_U,^] RbUTU >SQ`QSTQT dQ|Rvt^TU_dbQSeU^dQ8&`_baeU%6_]_Q^dbc_RcUbfQT_%Q`QQRbQ>SQ`QSTQT% U^ce ec__bMM^Q,i] sc S_] x^%Lc e^dtbj Y_ bb/Qdf_4i dtb/U U, bbc`Ud_Q\Qf_\e^dQT i U, Uc\eUbj_%6_] _ U^U, SQc_TU ce`_^UbcU% S_] _ QSd_c aeU cUTUbfQ^TU e^XsRYd_WZ_i VeUbdU%neU_db_c aeU cebWU^cw_TU_SQcY_^Uc dbQ^cYd_bY_c i SQecQc' 9 U XUSX_ VQf_\e^dQT i UcY_biQbcUU^ S_^db2%_TYBUbU^dUTU_c Q&d_c `bUcU^dUc TU\Qf_\e^dpT c_^U^~Y^Vk^^SQc_Y|QM^QR\U%YMSX_c Q&d_c cUQ^_SQcY_^Q,_ XQR\dbQ4`_baeU Uc_ $\label{eq:local_continuity} $$ \end{figure} $$$ \end{figure} $$ \end{figure} $$$ \end$ $QSd_c TU VQf_e^d TU^* U_0 dQU C TU U_0 i U V V U i_c i_c C_^NU^*] eSX_c SQc_c\% eU f U^* Y CeNSU^dU i_f Q^_NQ dQf t c_TU VQ VZU_0 QTU VQS_cde] RUBB$ $SeQ^T_ Q_SQ_W^- TUF_eSY_U^-WQWeU_iQTUQS_cole] \ RbUi \ ce`UbQ_d_T_c \ C_TUWUSd_bUc \ dQ_`_c'SW^': ^UcdUcU^3fT_%c^X_] \ RbUi \ ce`UbQ_d_T_c \ C_TUWUSd_bUc \ dQ_`_c'SW^': ^UcdUcU^3fT_%c^X_] \ RbUi \ ce`UbQ_d_T_c \ C_TUWUSd_bUc \ dQ_`_c'SW^': ^UcdUcU^3fT_%c^X_] \ RbUi \ ce`UbQ_d_T_c \ C_TUWUSd_bUc \ dQ_`_c'SW^': ^UcdUcU^3fT_%c^X_] \ RbUi \ ce`UbQ_d_T_c \ C_TUWUSd_bUc \ dQ_`_c'SW^': ^UcdUcU^3fT_%c^X_] \ RbUi \ ce`UbQ_d_T_c \ C_TUWUSd_bUc \ dQ_`_c'SW^': ^UcdUcU^3fT_%c^X_] \ RbUi \ ce`UbQ_d_T_c \ C_TUWUSd_bUc \ dQ_`_c'SW^': ^UcdUcU^3fT_%c^X_] \ RbUi \ ce`UbQ_d_T_c \ C_TUWUSd_bUc \ dQ_`_c'SW^': ^UcdUcU^3fT_%c^X_] \ RbUi \ ce`UbQ_d_T_c \ C_TUWUSd_bUc \ dQ_`_c'SW^': ^UcdUcU^3fT_%c^X_] \ RbUi \ ce`UbQ_d_T_c \ C_TUWUSd_bUc \ dQ_`_c'SW^': ^UcdUcU^3fT_%c^X_] \ RbUi \ ce`UbQ_d_T_c \ C_TUWUSd_bUc \ dQ_`_c'SW^': ^UcdUcU^3fT_%c^X_] \ RbUi \ ce`UbQ_d_T_c \ C_TUWUSd_bUc \ dQ_`_c'SW^': ^UcdUcU^3fT_%c^X_] \ RbUi \ ce`UbQ_d_T_c \ C_TUWUSd_bUc \ dQ_`_c'SW^': ^UcdUcU^3fT_%c^X_C \ C_TUWUSd_bUc \ C_TUW$ U^TUCMMQSQTQUCSQ(YMET i \QcUMFYTe] RBU Qe^\eUbdu XsRYd_' DUb_`eUTU cUbbu\QdfQ[U^dU\wSX|XQSUbe^Q] _TWBQS\wY%_^bL\c\USd_ QdQ\Uc Uf'MOT__Uf'MOT_'6 SQecQTUUcdg'%Q\f}`_c\R\\YFQT]_bQ\aeUQc'xdUQ_c XsR\d_c\Mc`\USQQ]U\^dU_RdU^UU\^_]RbUTU≯SQ`QSYFQT' M $aeU \setminus Q \log_{W} \text{ `$ eUTU LUCY dB} \setminus Q \text{ `$ UUQ V aUQ dbQftc TU \setminus Q V aUQ } \text{ $ QTU \setminus Q S_cote } \text{ $ RLUSSeQ^T_ \setminus Q_SQ_V AV_ $ TU feU f U^2 V Q V aUQ } \text{ $ QTU \setminus Q S_cote } \text{ $ RLUSSeQ^T_ V Q_SQ_V AV_ $ $ UUQ V aUQ } \text{ $ QTU \setminus Q S_cote } \text{ $ QTU \setminus Q S_cote$ d_T_c _c TUMUSd_buc TU dQ_`_cYSW^: ^ Ucdu cU^dfT_%e^X_] Rbu`eUTU UcdQbU^TUcWQQSQTQTQ UcS\QTYBET i \QcUbfYfe] Rbu Qe^\bubdu Xs RYd' Dub_ `eUTU cUbBUQdfQ] U^dU \sSX(XQ5Ube^Q] _TNX5Q5W^%_^BL\c`U5d_Q\dQUc Q5d_c \eaeb_c%_] _ _ c_^cw__5QcY_^Q,i ddQ^c\d_bQ4`_baeU U,] _df_ _ SQecQdbQ^cYg_bQ%YUcds`bUfYd_%Q]U^eT_`eUTUcUbNsSYJU^dUUfYbDT__UfYbDT_'6 SQecQTUUcd_%QYJ`_cYRYYTQT]_bQ,aeUQcYdUQ_c XsRY₫c WZc%lc`USQ() U^dU_RdU^UU,^] RBUTU≠SQ`QSITQIT MU^₫^SUc%L]_|VQf_\e^dQT`eUTULU]_dQ) U^dUUYTYBUSdQ) U^dUULYCdbcUQcu] <u>```</u>;] _% XQ\$Ub_ U^fQ^_%U^U, SQc_TU_c XsR\d_c \eUbdLt4`_b_ aeU\QbQ; w^`eUTU\bL\c\db\Q`bLcU^dU QdQ; t c TU\Q**X**Uj QTU\QS_cde] RbU3

 $\begin{tabular}{ll} QSd_c TU VQf_\e^dQT\% ce buc'cdu^SQY'ceVISYU'du4i Ucd_Uc] sc S_] x^] U'du U\SQc_dQ] RYL'^\%eQ^T_cebWU^_c QSd_c TU VeUtdU Xs RYd' \\ \begin{tabular}{ll} Xs RYd' & Xs$

] ei TWUBU/dUTU.ce Yj ` baQSYw^ bYWYQ,'@Q`QQRbQ.cYWYWBQ.c \Qj U/dUe^QY/SQ`QSYTQT^QabbQ,%U^U, ec QTUSeQT TU\Q] Y;] Q4i cU ^e^SQdQ^] Q\SY_c_%_`eUTUc_cdU^Ubce] Q^_Q,W\`UQ%_aeUt\^_UcSQ`Q;TU]_cddQbceR_^TQTfUSY_4_aeUe^R_bbQSX_%TUZw $aeUce\ Q`Udd\ ^\ cUQdQ^\bUdd\%'\ `eUTU]\ Q^dU^Ub\QS\ `QTU\ ce\ R\ SQ:\ ^UL]\ sc\ UcdbSd\ TUS\ b\ TU\ Uh`bUc\\%'\%e^X\]\ RbU\ dU'U\ e^Q$ S cQU^ce` TUb%YUc aeU\ dW^UU^ce U\USSW% U^ce U\USSW3e^X] RbUi ^ cU`eUTUTUS\bluQ] U^dUaeU Uc YSQ`Q; TU XQSUb e^QS_cQ%5eQ^T_t\`eUTU_XQSUb\, cYaeYUbU_GU_TYSU_TUV_bj_QY^QTUSeQTQ%aeU_e^Q`_Ubc_^Q^_`eUTU_bUQ\Y_Qb\Qc_QSSY_^Uc_UhdUbY_bUc% $aeUc_^TU`U^TYU^dUc~TU,QSd_TU~Qf_e^dQT%~QSeQ,cU~UU^UCD_QQSQR_S_^VQSYNTQT%YU,QSd_TU~Qf_e^dQT~UcdQRQ^`bUcU^dUc'~McY$ QWe^cQc`USdc]scYQTUSeQTQ]U^dUTYZaeUt\UcYSQ`Q;TUUZDbSUb\cQSdcTU\Qf\e^dQTQcu]Yc]_c4`baeUUc]sc UFYTU^dU] U^dU VQxCQ%6_^bUc`USd_Qt cd_c%eU ^_`eUTU cYf Q\$`QtQTUSYb_%Uc e^QS_^dtQTPSSYv^VtQ^SQ] U^dU4Uc TUSY%eU ^_`eUTU aeUbUt%cY\ XQSUf \e^dQT' MU^UcdUSQc %' cw\ UcfUbTQT%aeUUc\sSK' QbQe^X] RbUQXQSUb\QS cQcY\ XQbs% Ub U\,] ei Tt' eUcd_UcU, XQSUb4SeQ^T_ e^QfUj aeUXQaeUb1T_%UbUQ\YQ\QS_cQ4i ^QTQ] sc aeUaeUTQ`_bXQSUb1D_b_dQ^d_%b^UcdQc S_cQc%TUQtbReYbe^\^Se] \\] \Yrd_Q\Q\Q\Q\Q\QTU`_TUb_XQRYfTQT%_ Uc Zecd 4`_baeU_ aeU aeYbbJ^%_ Uc e^`_TUb%\^_ e^cUb TYÉ`eUcd'=Q; VQSeVdQTUcTU\Q] U^dU% e^QSQ`QSTQTTU\Q^QdebQUjQidT\ TUJ sc%eVISYL^dUc% Ub e^QTYÉ` cYSW^3^QTQUc aeUbUbcY^_ e^Qf_\e^dQT'

GUSSYu^j'

: $^SeQ^d_QQ^_SU^TUQ^NUDTi_TUQ6WD^SQ]_kQ'$

 $\begin{tabular}{ll} : \c\superscript{NVMSQT_SQb_i Uf\structut_VQ} \c\superscript{NC_NVMSQT_SQb_i Uf\structut_VQ} \c\superscript{NVMSQT_SQb_i Uf\structu$

CONST. % PNY CANAROL "PANACY! OLICECT. IN O'CHRO'RDROC'RDGRON

CONST. % PNY CANAROL "PANACY! OLICECT. IN O'CHRO'R PDGRON

CONST. % PNY CANAROL "PANACY! OLICECT. IN O'CHRO'R PORT N' PS. TO CONST. (*CONST. *CONST. *C

@\\RUbdOTTU\Qf_\e^dOT ?_^Q\$KQ^^: Tg Q\$Tc

 $\label{eq:localized-control} $$ J_{e^0} = QWU^0U = QUU^0U^0Qf_e^0Qf_e^0QT3U, TUbTU UUWWW_0^0CW_0^0 dU^0U e^, TUbTU UUWW @ aeU dU^0U, $$ TUbTU UQf_e^0QT U e^, TUbTU UQWW @ aeU dU^0U, $$ J_U Qf_e^0QT3U, TUbTU UQf_e^0QT b_, YU MU, aeU dU^0U, VRUbaQT TU XQSUbS__^UBJ U Q ce $$ J_e^0QTWU U U, TUbU U GWU^0U aeU Ucds , cuuT_ TU VQf_e^0QT4i _ VQf_e^0QT aeU Ucds , cuuT_ TU 9 USJ_c S__^b_, YUTQT\aeU e^Qf U TUZQbceU\d_d\dU^0U U, TUbi VQVWU^0U aeU Ucds , cuuT_ TU f_VQb \ GUbV\RUbU U Q, b_YUTQT TU e^QWU^0U\aeU Ucds , cuuT_ TU , TUbUc i VQSe\dQTUc\aeQf S_] _ cuQ Qcded_\fQYU^0U\awWu^0U_b c_\forall S_U_i G\cdot GYU \ SQ\U VUTQTUc TU c__\forall VUTQTUc TU V_b_YUTQTUc TU \ b_YUTQTUc TU \ b_YUTQTUc TU \ b_YUTQTUc'$

6aeuSQRU cUvQQQ%aeU XQ; e^QTYKUtU^SQQVtdu\Q6WU^SQStbe^cdQ^SQ\;] _bQ;TUe^QbUMQi e^ceZUd_'@_\(Q] _ Stbe^cdQ^SQ\;QaeU cU U^SeU^dQcw\,U^\QT%UbU^SQTU\,cYSU^df c] bQlbc% b\ caeUc ^cecSU^dR\lb TUfUbcUY\Ye\f c%bbe\dQ^dUTU\QT\WUbU^SQTU\Qc Stise^cdQ^SQc! I ^W RUb^q^dU%eU QSdkQc \Q| U^dU U^SQ\ffQT TU dQ\% Uc SQ\Q| TU cUb\Y\VeU^SQT \ be^Q\Ui] kQ\% cec cQ^SY ^Uc TU Q| U^Q| Qci `b | UcQc%US | `U^cQci SQcdWc% | U\dU| QUc4Qe^aeUQ| R c `eUTU^UcdQbY\\eYT c ` be^QS\U^SQTU\R\U^i TU\] Q\] bQ\ $M`_b_d?d_VQ6WU^SQ2]_bQ,TU,GUbGe`bU]_\%eeU_QSdvQcw_U^VQSQ`QSTQTTU_e^W_RUb^Q?dU_XQSQ'cec_SbQxbbQc%~^e^SQS_]_ceZUd_%U$ TYBUBU^SQU^aeUU,BUc`Ud_TU\Q6WU^SQ]_bQ,TU_c cUBUc YYBU\WWTAU SBUQT_c' @Qc QSSY_*Uc TU9Y_c% U^`QbBe\Qb_c aeUcUUBUBUS_]_e^ W.RUb^?^dU] bQ\%\$U^U^SQ\%\$QSY^Uc] bQ\Uc%\c^] bQ\Uc%\c^] bQ\U^dU.ReU^ U^U,]sc Qd W&QT 'G^]sc`Ub\U5dQ]U^dU.cQ^diZecd4iXQiaeU $RU^{-}] \underline{bQ} = U \underline{bQ} + U \underline{bQ}$]_bQ,i6WU^SQ%Q\eU^dUiU,\ucdQT_TUd_TQfYbbeTiU,RYU^]_bQ,4Qe^aeUU^bQjw^TUcecUbce`bU]_c_RBud_T_%_Uc`_c\R\UaeUT\RUboQ $\textbf{UcU}^{SQ} \textbf{UcU}^{Q} \textbf{UCU}^$]Q,]_bQ;4e^Q;SQ`QSM*QT`TUTY:SUb^baeU\QTXWYTQT`]_bQ,i U,TU] t bb<u>d</u>%_b_aeUQW**e**^Q; S_cQ; c_^TXWQ; TUU_W<u>Y</u><u>%</u> <u>bb</u>_c aeU] UbUSU^ $Sel' Qi U_i SQcdW_4i dQ] RY_0^e QSQ' QSYQT TU U_iUSSW^W_i QUUUSSW^WeYQTQ'_bU_iU^dU^TN_j YU^d_W_i e^Q`_dU^SQQTU QSeldST_QCe$ $\label{localization} $$UUSSW^{-}_b^0GUSW \ cUbSQ^G \ TU XQSUbUcQc S_cQc \ aeU Ucds^U^U_U] \ sc \ Qd_cU^dT_ \ QRUU \ M \ Qaeuaet \ S_^cYcdU] \ eSX_ UcQY_G \ QWU^TU 9 Y_c \ degree \ d$ aeUXY_Q,X] RtU/#aeU\UU] c%<t^Uc\x*3#/%+0% SQ`'23/'\$D bU,SeQ,9YcU,X] RtUcUTx6d^VeUTU\Qc RUcdQc%QcQRUUU^cx84(QSe\xq0TUc i`b^\$Y`Y`cTU\Q^QabbQU`Q%QSeQ,p\UcSQ`Q`TU6WU^\$QQ`|bQ\:^^UcdS^`cYdUU^WQ^]UTYTQ\Q\]QWU^^QabbQ,TU9Y`c4]YU^ddQ:aeU\Q $\underline{d}_{\mathbb{C}}$ aeU] Ubusu^tu se(`Qi U, sqc \underline{d} M_4i \underline{d} Q) RYL^ee^Qsq`qsmqt tu u,ussw/% (Quuessw^weyatq`_bu, u^d/th] Yu^d_% e^Q`_du^sqtu qsdeqb $TU QSeUdT_Qce U(USSW^-_`_b`QSUb% cUbSQ`Q] TU XQSUbUcQc S_cQc aeU Ucds^U^U_I] sc Qd_cU^dT__LQR(U M Qaeuaet S_^c)cdU] eSX_UcQ_c S_cQc aeU Ucds^U^U_I] sc Qd_cU^dT__LQR(U M Qaeuaet S_^c)cdU] eSX_UcQ_c S_cQc aeU Ucds^U^U_I S_cQc S_cQc AeU AeU Ucds^U^U_I S_cQc AeU$] YU^dtQc aeU\QY| QWU^Uc`YbdeQii]_bQ\YU/U, aeUU,X_] RbU\eUXUSX_U^e^`bY| Ub]_] U^d_\%_^c\cdQU^aeU\QUhSU\U^SQ]_bQ\TU\QaeU $\label{thm:local_continuous_con$ `_du^sqtu qsdeqbtu qseubt_ qce u\ussyw^_ `_b`\qsub% cubsq`q; tu xqsubucq: S_cq: aeu ucds ^u^u,] sc Q\d_cu^dit_ _qr\u M qaeuaet S_^c't'dU] eSX_ UcQ\jj Q\NU^TU9Y_c aeUX\j'_Q\X_] R!bU%eU\UJ]_c%t ^'Uc't *3H/ %10% SQ' '23/ '\$D_bU\SeQ\9Y_c U\X_] R!bUcUT't'd\WeUTU\Qc RUcd'Qc\QcQRUb' U^\U @\\ruadot τυ\Qf_\e^dot ?__^QXQ^^: Tg QbTc

D6FHt ≫

; eU_ `eUTUS_^SURYbcU

GUSSY₁^ >

 $\label{thm:continuous} \mbox{MUbi] } \mbox{UbyeVQ$\%$_i QS_siUd$byQYTUQTU e^^`_TUbTUQed_TUdUdj YQ$\%^TUVQf_\e^dQT3U^\QaeU\%TUQedUT_S_^_c Qdj Y^Q^_c\%U^aeU\%TUQedUT_UQUdj Sc \\RUbdQTTUVQf_\e^dQT4i TU]_T_ Uc`USQ\QYfUcd\\Q$\%QcUQ^_S\QbQ] U^dU Q\cebT_\% e^QYYS_^\c\du^SQ] Q^\\Cd\cepta_\cepta$

 $6 a e u - f_i \ QYCYCDDU-VQWQYYS_YIUYUSQTU DQUC YIG QCTUXQRQDS_] - VQf_\earDTTUUDI YQYUUV-Cu^\ _ taeUVQC QSSY_YUC XQY TU CUDQDReYT_ QV_c QWUYUUW ^- QTUSeQTQ] UYUUQVQC VQSeVDTUC TU_c QWUYUUC4TU aet] QYUQQYI \ b_`YQTU XQRQDS_YTESU Q] eSX_c Ubb_buc%] eSXQS_\earDY_BCUY\QG_\earDY_BQUUC TU_c QWUYUUC4TU aet] QYUQQYI \ b_`YQTU XQRQDS_\TU\Qf_\earDTTU VQTUUDI YQSWYUYCUW _- QUUYUVQF_\earDTWS_] _ UX UUUUI YQSWYUYCUW _- DUU CYWYWGQTS U, Q] QTYC eUcdQ J_i QTQb_bCUYQT_\aeUUQY _- CUXQR\QTU\Qf_\earDTWS_] _ UX UUUUI YQYUWAEU CYWYWGQYU U, Q] QUYUUUZUSSY_TUe^\`_TUbTU\Qf_\earDTW_\QF_\ea$

@\\Rubattr TU\Qf_\e^attr

UCQVQSe/dQT D bUc %SeQ^T cUTYSU%Qf /e^dQTTUSTU TUdUdj YQXLbdUcYVYWSQT TURUcUt%seU/Q`Ubc ^QXL/^U, UZUbSYY TUBD TUbTU/Q f_k^dT; Wrs2M\% N'Q} Q%5x6Q^T_TU]_T_f_k~dQY_%TUdU; YQ D_b/_dQ^j_%YQf_k~dQTTUdU; YQd_TQce`b_`Y_\%WQ\$&QWQJ QTU `b`YcQ\$dc% b\QUUS\$M^TUcec`b`YcQ\$dc'GY\Qf\e^qQTTUdUb]YQ\QUUS\$M^65^d1eQ\$M^%QcwbTU^UciTudUb]YQ\QUUS\$M^4i\c `b_`Y_c Q&d_c\%BUL%U^d_^SUL SQTQQ&d_\%BUTUUUSSW^Ucdi TUUUB_Y^QU_`be^Q\U Q^UUY_bTUUUUSSW^WQUUSSW^TUUCUQ&d_' McYULUQ&d `kUSUTU^dUTU/QcUts dQ] RYL^e^QSd_\RKU%U^d_SUc`_bUcd_c`bYSY`Y_c%U^UcdUQSd_dQ] RYL^%QF_\e^dQT Uc Qed_GTUdU6J YQT_3Uc TUSY\$%Lcd_% f_\e^qQT%\QU\USS\w^TUUc_'@_aeU^_c\\UfQT\BUSQQ\U^qQ\$_^dqQT\SS\w^3`_baeUce`_^Ue^Q\$d_TU\Qf_\e^qQTaeU`bUSUTUQ\`bY\UbQ\$d_ TUd_T_U,dW^SYMMbi TUdUdj Y^QbU,bUcd_4_e^QSd_\NBUTU\Qf_\e^dQT%Q^dUcTUaeUU,`bij UbQSd_\NBUTU\Qf_\e^dQT'CTU_S_^dQBY $TURUJ = c_{WW} C_{SW} - C_{SW} C_{$ $d ? d \ ^ Uc = ^QSd \ / RUJYJU \ UcdQ \ ^ SW^TU \ / RUJdQTS \ Ub \ CYU, \ bif \ Ub QSd \ U^U, \ dU^ %QTUdUb \ / QSW^i \ / Q W 25W^TU \ C TU \ sc% \ cUQ \ / RUJY \ bif \ Ub QSd \ U^U, \ dU^ %QTUdUb \ / QSW^i \ / Q W 25W^TU \ C TU \ sc% \ cUQ \ / RUJY \ bif \ Ub QSd \ U^U \ dU^ %QTUDUb \ / QSW^i \ / Q W 25W^TU \ C TU \ sc% \ cUQ \ / RUJY \ bif \ Ub QSd \ U^U \ dU^ %QTUDUb \ / Q W 25W^i \ U \ Ub \ C TU \ S C W \ C W \ C TU \ S C W \ C TU \ S C W \ C TU \ S C W \ C W \ C TU \ S C W \ C TU \ S C W \ C W \ C TU \ S C W \ C$ $\begin{tabular}{ll} QSd & aeUU, Q] & QWWUf & aeUUc & aeUUc & be \colored \colored$ $\label{thm:condition} $$ Uc_' @ aeU _c \|U^TQT'\|USdQ] $$ U'dU Qe^QS_ddQT'\|SS'w'3`_baeU ce`_^Ue^QSd_TU'Qf_e^dQT aeU`\|USUTUQ_i`bij_UbQSd_TU_d_T_U_dbU'%T'bwibbi_e^dQSd_TU'Qf_e^dQT aeU`\|USUTUQ_i`bij_UbQSd_TU_d_T_U_dbU'%T'bwibbi_e^dQSd_TU'Qf_e^dQT aeU`\|USUTUQ_i`bij_UbQSd_TU_d_T_U_dbU'%T'bwibbi_e^dQSd_TU'Qf_e^dQT aeU`\|USUTUQ_i`bij_UbQSd_TU_d_T_U_dbU'%T'bwibbi_e^dQSd_TU'Qf$ $TUBUG_1 YCOUNBUC_2 = ^CSG_1 YBUTU_1 C_1 - ACT YCOUN_C TU A BUUN_D YCOUNBUTU_1 C_1 VBUTU_1 C_1 VBUTU_$

GYQf_le^dQT%aeUU^S_^dtQ]_c W RYUb^Q\ c] YUJ Rb_c TU\ SeUb^_W TUdUbJ Y^Qcec] _fYJ YU^d_c%_ dQJ RYt^W RUb^QbcU Qcu] Yt] Q% |Tudud| Y'Qcec`b`Ya: QSSY ^Uc%eU%YTeTq%, c Tudud| Y'QTU\Q] Yc] Q] Q'Udq/XYS\ec` bf \YSY ^Uc Q'dUSUTU^dUc' @Qf \e^dqT TUDUB YQSWY%QTYBUSSWY% Q,] QYT TUSeQaeYBDS cQU^QRc \ed 'DUCUQdT \ cS] QYT c%tU bTUYQ` be^QSd TU\Q $aeUTUdUdj \UpsilonQ_ddQc S_cQc aeUUcds^RQZ_ce] Q\UpsilonT_'6cuaeUcYQ\YRUbdQTTU\Qf_\e^dQTS_^cYdUU^Ucd \%aeUdYUUU^cui cec`b`YQc$ $QSSY_^UC RQZ_Ce] Y^T_i TUUSSW^% cec `b_`YQcf_\SY_^UC cUTUUUt] Y^Q^`_bcu] Yc]_\% eUfQQcUWeY\%eUSQTQf_\SW^\YRbU cebWU$ $TU_dtQf_\S'w^Q^dUSUTU^dU^3T)\%Mbi] Q^T_aeU3i cYaeU\Qf_\S'w^T)\%MbcUbdQ] R'tt^\NBU%U^aeU dQ] R'tt^cUTUdUd] YQ\Qf_\e^dQT4$ Uc TUSYS/aeU/Qf /e^aQT Ucds TUUUd /YQTQ` b/QTYSUSSYW^TU db Sebc Q^aUc TUUC 4i QcuceSUCYQ] U^aU%QcdQaeU/\UMQ] c Q/Q `bij utqof_le^aqtTU^d_TQ\QcubKBi_cYUcQ`bij_utqof_le^aqtTcUQ\/RtU% \QQed_5TUdUbj_YQTQf_le^aqtTU^t\%QS_^dYeQSW/%aeUUcds TUDULG YOTQ` b dDCf /e^DDT aeU`bUSUTU @ SeQ, Uc e^QS ^dDTNSSW/4` baeU` b/Qce` c/SW/%aeU`eUTU dU^Ub^YW&^ Q^dUc TU aeU% QQQTYBMMb TUdUbj YQbaeU%Q,cUbU,`bij Ub U^U,dbU^DUb cYUcQ`bij UbQf \e^qQT^ Ucds TUdUbj YQTQ` bSeQaeYUbQSd `busutundutu/Qf_/endqt%vvd_nsuc ucu qsd_n_ ucds tuddd; Yrqt_ `_b/Qf_/endqt% `_b/_ dqnd_n_ uc/Rbu un/Qn_svwnqd; Ynqn_ tu \Q\\RUbaQT%aeUS_^c\cutuU^\QQed_TUdUq\\YQ\$fw^TU\\Qf_\e^aqT\McYUcU`bij\UbQ\$d_TU\\Qf_\e^aqT\aeUTUdUq\\YQi\\XXX_c\Q\$d_c `_cduby_buc%__`eutTu_cub\\Rbux%Y^We^_tTu_c c\We\U^ducQ5d_c aeU_c_^Tudubj_Y^QT_c `_bu\\Q`eutTu_cub\\buu'&GYce`_^Uj__c aeU_XQ; $SYS_QSd_CU^*U_1dU^*M_1aeY^d_i \times dI_TUdU_1YQT_`_bU_1SeQd_1^W_1M_2SeQ_1^W_1M_2S$ U\`bij Ub 4cY(Q`bij UbQ $^{\wedge}$ Ucds TUdUbj Y^{QT} $^{\circ}$ b/Qf $/e^{2}dQT\%$ $^{\circ}$ $^$ bUQ] U^dU`_b\Qf_\e^qQT3Uc TUSY%aeU SQTQ e^QTU U\\Qc c_^\Qc aeU c_^% ^_ TU_ddQ] Q^UdQ%_ Uc \Q`bij UtqTURYIT_Q\Qf_\e^qQT7% `Ub_Q\QTUdUd]Y^QSW^TU\Q`bijUbQTU\QcUbXV%aeU^_UcTU\U^TVY^dUTU\Qf_\e^dQT%;Uc\QaeU\Qf_\e^dQT_^_dXV^U_^YV\e^^Q]Q^_ $\text{U^{QTUduB}_{1}YQSW^{\prime}McYL^{\prime}_{2}Ucd_{1}aeUUSMU_{2}aeUcUts_U, blucd_{3}TUduB_{1}YQceUhcdu^{SQAD_b}_{2}Q^{\prime}_{3}Q^{\prime}_{3}B_{1}UcQTUduB_{1}YQSW^{\prime}_{3}$ TU ce UhYcdU^SYQ ^ Uc TU \Qf \e^dQT'

@\\ruador τ∪\Qrf_\e^qdor ?__^QX\Q^^: Tg QbTc

:\SQ: Uc\J,] Y:] %YU^\eWQbTU e^QSQTU^QTU SY'S QSd c TU\Qf \e^dQT%TURU] c ce` ^Ube^QceSUcYw^TUTYUj % SYU^% TYUj] Yi GYUN, BYJ UDQSd_aeU ^_ Uc //RBU/%Lcds TUdUbj /YQTQ `_bQW_ VeUbQTU/Qf _/e^dQT% Ucd_TUdUbj /YQU/,c/WeYU^dU QcUbQWbQTQR/U Qcu $Q_{W^{2}}Q_{Q^{2}}W^{2}Q_{Q^$ QSeUIST S ^UcdQ ^ SYW^TU\\RUIGIGT GYTURU] c ce` ^Ube^Q\Q\$WQ\$QTU^QTUTYUj] \\\\U^\Q\$Uc\%Q^S ^U\$dQT c\%eUcYU\`bij UbU^\Q\$U cU] eUf U%U] f Uts Q, cYMeYU^dU% aeU U,`bwhj 4i Qcud TQ\QSQTU^QTURU cUbTUdUtj YQTQQ,] f Yj YU^d % U^\QTYBUSSW^TU ce]_fY]YV^d_%_bU\]_fY]YV^d_TU\`bY]UbU^\Q\$U4i aeUUc]_fYT_`_b_dtQ\$_cQ4U^\UcdU\$Qc_%Qe^aeUd_T_c_cU^\Q\$Uc%Ub_e^_%_^ $] \ \underline{\ f'} \$ SeQaeYubQed & _f\] Yu^d _ `_TubTu Qed Tudutj Y^QSYv^Tu\QSQTU^Q% sc aeU cYSQTQ U^QSU cU dtQc\QTQb ^TUY`] UT\Qd `_bQW aeU ^_`UbdU^USQQQ\QSXQ/^&GYU\^_cUbs\\?BUU^U\`bijUbQSd_%_aeUXQSUaeUU\c\YiVeYU^dU%U^d_^SUcdQj`_S_UcWiQeYdQU^U\c\YiVeYU^dU% aeUUc SQecQTQ` b\QaeU`bij UbQSd 4`eUc Qe^aeUTUXUSX \Qf \e^dQT SQecw\%^\Uj RQbW\%^ \ SQecw\\RbUj U^dU4` baeUU\QSd `busutu^du%u^\Qaeu\veu\sqecqtq%_ ubq\\rbu Mtu ^eui_%Yu\ ^_ cubs \\rbu \v\ cuwe^t_ qsd_%_b_ aeu dq] `_s_ `eutu ucdbu^\Q dlfsUtQ%aeUUc SQecQTQ`_bUc_4`_baeUTU\WeQ,] Q^UtQ%aeUU,dlfsUb_cUTUdldj\Yw] UTQ^dUe^Q\$d_TU\Qf_\e^dQT aeU ^_UtQ\\RtiU MQcu`TU] c`QcQbQ\QcYWeYU^dUQSd % $TUtcdQQ\QcWeYU^dU4i$ Ses^d dVJ ` c UFUb\QceSUcYw^TUQSd c Ucds%dT Uc e^ 3cYQ `bij UbQU^\QaeUd_TQ\QSQTU^QTU`U^TU% aeUTUbUbj YQd_T__TUj sc%_ cUbe^Q5d_\RbU%Qf_\e^dQT_^Uc\RbU U^\QSQecQ_\Q TUUUI] YYQSYV^TU SeQaeYUQTU TYSX_c QSd_c4TURYT_ QaeU U\ QSd_`_bU\ SeQ\ cU TUUUI] YYQ Qd_T_c U_c ^_ Uc e^QSd_\\RbU4i `_b_ VéUtQTU\] e^T '

GUSSYu^≯

] QHQ: ce`eUcQ: V_H] Q: TUU\eTYb_ Q^dLHY_be^HQ]_^Q] YU^d_ S_^cYTULQT_c'

 $\begin{tabular}{ll} GY QLQ UNETYB/Q VEULG QT IN QROUNT QT_SWQ a eU TUSYB'ABEU SeQ'T_ \ c Qd] Y'YQ^-c XQR\Q^TU\Qf_\e^dQT TU QF_\e^dQT TU UNL c TULULG YQ \cdot BSEQABYLDQSd_Q^ULUY_B'ABEU e^QSd_TU\Q F_\e^dQT TU UNL c TULULG YQ \cdot BSEQABYLDQSd_Q^ULUY_B'ABEU e^QSd_TU\Q F_\e^dQT TUULG YQ \cdot BSEQABYLDQSd_Q^ULUY_B'ABEU CUQ QSEQAT_UN\CTUBER TULULG YQ \cdot BSEQABYLDQSd_Q^ULUY_B'ABEU CUQ QSEQABYLDQSd_Q^ULUY_B'ABEU CUQ QSEQABYLDQSd_Q^ULUY_B'ABEU CUQ QSEQABYLDQSD_Q \cdot BSEQABYLDQSD_Q \cdot BSEQABYLDQSD_QSD_Q \cdot BSEQABYLDQSD_Q \cdot BSEQABYLDQSD_Q$

 $^{: ^`}bij \ Ub \ | \ Vb \ | \$

?_^QdKQ^: Tg QbTc

aeUU,`_TUbTU\Qf_\e^qQT%_U,Q]_QU^U,ec__U,UZU576Y_TUUcU`_TUb%TUUU,]_YQ\Qf_\Y5W%Y^e^Q5d_TUf_\e^qQT aeU`bU5UTUQ \Qf \\S\W^TUdUb] \YQTQ\%Uc e^QS ^dbQT\SS\W^

 $: \land \texttt{cUMe} \land \texttt{T} \texttt{\w} \texttt{\$ $\verb|Q"dUc cU_RcUtf w%J/SQTQQSd_TUf_|e^dQT'%Q| e^QUUSSW''\% e^Q`_dU'SQTUf_|e^dQT Uc e^`_TUbTU UUW\ DUb_cYe^`_TUbTU UUW\ DUBU UUW\ DUBU$ U/USSW^TUdUdj YQe^QS cQU^\eVIQbTU dIQ%Y^U/UMbSeQaeYUbS cQ DUb cYe^` TUbTUU/USSW^TUdUdj YQ\Qf \e^qQT` b\QU/USSW^ $TUU (QXU)^2 (ABUU U QXU)^2 (ABUU U QXU U$ ^_ TUSYS%aeU \Q\QSe\dT%_U,Q]_Q%TUdUd]_Y^Q.ce`b_`YQf_\e^dQT%Ub_^_`_bSeQaeYUbQSd_%Uc e^QS_^ddQT6SYW^ 9URYT_QaeUU,Q]_Q `QbdSe/Qb%TUSYTYb TUdUbjYCqbSeQaeYUbS cQ%Uc/QTUQSdeQb4iUcd cUce` 'UB`QbQU/QJ] QcUXQR(QQaeuS] cYUYT e^QTU/Qc f_\\S\W^&_U\d'_`Qad\Se\Qbi \QV_b|QTU e^Q\$d_TU f_\e^q\$T! DUb_ cY^TETQ%LcdQQ\$S\W^^_Uc_]Yc]_\$_^U\U\VSd_%\$_^U\ \\TU\Q `b_Tessam^tu\Qaeucuuzdbsu4`ub_turucubQw_q^duby_bQu\Q@ctuvu^c_buctuucdQatuQtu\Q\xudottu\Q\xudotttu\Qf_ke^qott%qxqqbtue^Q $SUddQc_RUdQ^{\dagger}QT^{\prime}_b^{\dagger} = dQT^{\prime}_b^{\dagger}QAEUdU^{\dagger}U^{\dagger}_b^{\dagger} = dQT^{\prime}_b^{\dagger}QT^{\prime}_b^{\dagger}QT^{\prime}_b^{\dagger}QT^{\prime}_b^{\dagger} = dQT^{\prime}_b^{\dagger}QT^{$ $TURU \ cub \ u^* \ cu^* \ cu$ TUDUGI YQQcu] Yc] Q%QS_^dreQSYW% QcUQ\Qf_\e^dQT Uc QSdf_ U^\QTUDUGI YQSYW^TU cec f_\\SY_^Uc\ $^{\circ}$ __ Uc\ GYUcds QSdf_ W $\label{eq:condition} \begin{tabular}{ll} $$ VQSW^Uc e^QSd TU/Qf_e^dQT4i QcuXQi e^QSd TU/Qf_e^dQT_ddQTUddi YQSW^DUc cYQf_e^dQT^c Ucds QSdf_ \end{tabular}$ \Q\\RUbdQT%cUU^SeU^bUcd_%Y^_Uc QSdf_U^\QSf\^TU cec`b_`Y_c QSd_c' DUb_%Svi]_`eUTUcUbUcd_%Y^_Uc QSdf_U^\QTUdUbj \YQSf\^S UZDSSY_U^cui9U]Q^UbQaeUcYcUd]Qe^Qe_dbQ`QbdUTUUcdUTYU]Q%bcdUUcaeU]QTU\Q\RUbdQT%eeUS_^cxbdUv^`_TUbTU Qed_TUMUB) YQ\$NV^%Lk TUM_\$Q\$T_' GYXQ; e^Q\$d_TU\Qf_\e^Q\$T_U^\QTUMUB) YQ\$NV^TU_d_T_c cec` b_`Y_c Q\$d_c \\R\U\\\\Y\T /YRBJTU/Qf_le^ddTuc Tudud; YYQTQ`_b_ddQ4; Qcudu^u] _c u, QRcebT_TU SQTQ QSd_/YRBJ%^Slec_ /Q`bij ubg%Tudud; YYQTQ`_be^QSd_/YRBJ QYdUBYB DUb_cY^_XQ; QSd__UZUBSYY_TU/Qf_\e^qQTU^\QTUdUd_YQSW^TU/cec`b_`Y_c QSd_c%LYd_^SUc XQ; \\RUbaQT cUUZUBSUU^\Q $\label{local_continuous} $$ Uc \] \ $$ [\ aeU \ XQ; \ dQ, S_cQS_] \ _\ \VNW \ aeU \ S_ \ CXdU \ V^e^` \ _TUbTU \ Qed_TUdUb] \ YQSW^TU \ \VQf_\ e^dQT \ AeU \ S_ \ CXdU \ V^e^` \ _TUbTU \ Qed_TUdUb] \ YQSW^TU \ \VQf_\ e^dQT \ AeU \ S_ \ CXdU \ V^e^` \ _TUbTU \ Qed_TUdUb] \ YQSW^TU \ \VQf_\ e^dQT \ AeU \ S_ \ CXdU \ V^e^` \ AeU \ S_ \ CXGU \ AeU \ AeU \ S_ \ CXGU \ AeU \$

GYXQi aeUTUSY%eUcYRYU^UcSVUdd%YU,Qj QTUdUdjYQcec`b`YQcf_YSY_^Uc%TURUcUbQSdfQ%Q,XQSUb,% \QTUdUdjYQSYw^U^ $\hbox{cutURU clube} @ 4cy^U & \hbox{RQbW} \%_X & \hbox{CuSUcYTQT TU ce} & \hbox{CubUcdU} & \hbox{QcubQ} & \hbox{QcUbQ} & \hbox{QcUbQ} & \hbox{VQf} & \hbox{VGW} & \hbox{TUdUd} & \hbox{VQT}_4 & \hbox{Ub}_V & \hbox{Qf}_V & \hbox{Qf}_$ Q] QTUdUd] Υ QU, QSd_TU/Qf_\e^qQTU^\\ aeUtUb4aeUTUdUd] Υ Qce b_Υ Qf_\e^qQT%\J^\\ \] \tag{5d}_QSd_TU/Qf_\e^qQT4T\\ MWU i \\ \} \tag{70} ^^We^_TYWQTUUcdQ] Q^UdQ%TURU^cYWYM5Qbe^QTUUcdQcdduc5_cQc3_RYU^%#'\$EeUU,XU5X_TUTUdddjY7Q%Qe^aeUcuQQ^duc TU, Q5d_ TUdUd; YQT_ U^ U, _bTU^TU\Q ^QxbQUj Q%Qx^^_ Uc Q^duc TU aeU U, W^TU_c dVJ `_c ' C /#\$aeU U, Q5d_ ^_ Uc TUBURJ YYQYBU QYBUL TUL QSG_TUBURJ YYQT_% Q CUQ U $^{\prime}$ U $^{\prime}$ UUD $^{\prime}$ UV DU $^{\prime}$ QVBBQVLJ QWYYUL FUBTQTUBQJ U $^{\prime}$ CUD `Ub_aeUU,Q]QTU/QTUdUd;YYQSYM^TU,QSd_TUf_\e^qQTUc_]Y;]_S_^ce_UZUGUbU,QSd_TUf_\SW/3UZUGYU*T_e^QSd_`QbdSe\Qb S_] _ TU\Q] U^dU%U

@(\Rubat)TTU \Qf_\e^αt)T = ?_^Qδ(Q^*: Tg Qδ(Tc

#+\$GY^YVIA^ TYMQ%aeU U, QSd TUdUbj YQ^dU ^ Uc Q^dUc TU, QSd TUdUbj YQT % Q cUQ U^ U, _bTU^TU, dIUj ` _% TU \Q ^QdebQUj Q%YUc Tricting Tut 14' Up_ aeU U, UcveUij _ TU \QaeU QSd_ Uc \QTUdUij \rangle \QSd_4aeU \QtQU, Q] Q \QtQUZUSUbUbe \Qf_\SW^U^ \QtdSe\QS% Uc`_bU_ aeU\QSQecQi TUdUbJ \^QbaeUQSd_TUf_\e^dqT3U^UcdUXUTUcUvQQ\$\aeU\QS_cQU^SeUcd\w^`QduSUcUb_\f\TQT_%_cU] $Q^dU^U = UQ_U = Q_CSebTQT i e^YdUWWWWU^UCCTUUh` bUCW^4Q] U^c aeU dQ e^RZbU_bCWWWBQbQS_^dbQTUSYb$ $Xi_1' CU_1VS_k \setminus QSd_TUf_VSYk' \cap U^cuUc%_1' TeTQ%_QTUdUd_YQSYk' TU/Q] U^dU4Uc TUSYkUc VQ] U^dU TU \setminus QUQR_bQSYk' TU e^Q UVQR_bQSYk' TU e^Q UVQSYk' TU e^Q UVQSY$ $\label{eq:controlling} $$ S_S(Q_C) ^2 Q_UUSSW^U du U_c_] $$ S_C(Q_C) ^2 e^2 Q_Q ^2 Q_Q ^2 Q_Q $$$ $TU \setminus QU \setminus USSYM^{\circ} \cup UC \setminus [YC] = S_{\circ} \setminus QT \cup UUSSYM^{\circ} \cup UCUSSYM^{\circ} \cup UCUSSM^{\circ} \cup UCUSSM^{\circ} \cup UCUSSM^{\circ} \cup UCUSSM^{\circ} \cup UCUSSM^{\circ} \cup UCUSSM^{\circ} \cup UC$ `bUM\$^qQUc%aet_Y%eU^\$7Qc%7Y8WW_TUdUb]_YQ\Q]_U^dU__\Qf_\e^qQTTU\\UWQbQe^QS_^\$/ecYw^_TU\QU\U\$\$%^\$]___XQ\$U_Qcu\$_C \ aeUUc\QSQecQ%dbdbq%\QbQ\w^%b\ aeUS^SleiUTUUcdU] T%^TUdq56XbQcUTURUbUc`~TUb%TUQSeUbTS^\Q ^_SYW^Qtj\YYQ^_TU\Q\YRUbdQT%ieU\Qc\Y\\eU^SYQcK\\\%\bTU^Uc%TUbdJ\YQU^cuTUUcdU]__T_TUQSdeQbMcY_XQSU%TYW%tU^UaeU cub`_bQ\\\x^Qsd_Q^duSUTU^du'9US\\%aeUUc SQecQT_\%^\\eU^S\\QT_i TUdubj\YQT_`_bQ\W_% Qx^^_cUTudubj\YQ`_bSeQae\\u05_cQ $Q^* U b Y_b U^* U / U_b T U / Y_b C B C U C T U Q W C P Q U C T U Q W C P Q U C P Q$ Q^duc' GYU\ Q5d_`QbdSe\Qb_ Uc\éulig_ TUf_\e^dQT%_ aeUf YU^U Q\QUhYcdU^SQ%cUbSeQaeYUbS_cQTUdUb] Y^QT_ TU V_bj QQ`b_`YQTQU^ $\label{eq:control_c$ YVVeU^SYQcUTUSYTU\QSeUcdVx3oaet SQecQUcTYcdrdQTU\Q

?_^QdKQ^: Tg QbTc @Q\YRUbaQTTU\Qf_\e^dQT

UNUSA % QAUCTUIT/ DUb TUSYS/GEU/Qc wbTU/Uc cUbs^] U/AQUC%/YeU/SQc% TUdUb] YQQcu] Y] Q`QbQUZDBUbe^QSA `_bU,`b_`Y_] ei Uc\éUtj_%Uc XQSUbU,Uc\éUtj_ dQ^d_TU SQecQi U\USd_4_\QUIZUSYU^T_ e^QSd_dQ%QcUbe^QSQecQTU\Q UC/éUtj TU dQ QSd ' DQtQ \Q` KUM6^dQ UC%Ses\ Uc \QSQecQi \Q kQ w^TU, Q] QTU UZUSUbdQ QSd 5 6 \ aeU \Q kUc eUcdQ Uc% ^QdebQUj Q Q^dUc%cu

#'\$GYU\cYW"\\BQT_cUQ\\\aeU\\U:\\eU\j_TU\Q\]QTUe^\Q\sd_\Q\d\Be\\Q\bTU\\Qf_\e^\q\DT\\\\ku\c\\Y\\e^\Q\. $SQecQ4i\ aeU ^XQi\ QRc_edQ]\ U^dU\ ^YWe^QLQi\ W^TU,Q]\ QUcds\ TUdUb]\ Y^QT_QUZUDSUbe^QG_U^EQW XQSUbe^QU_USSW'%i\ ^_U^__db_49 W_W$ $\text{cyt.cdu.t.} \ \text{U,c)WYNSQT_TU_c} \ \text{Cd} \ \text{Y^Q^_c\%seQ^T_cUc_cdu^U^_dQ^c\text{LbQ}} \ \text{U^du} \ \text{Q/Qf_k^e^dQT_TUTutubl} \ \text{YQbcec} \ \text{`b_Y_c} \ \text{QSd_c\%} \ \text{`_b/Q/RubaQT_TU}$ \Qf_\e^QT`S_^c\cduU^`_TUbTU Qed_TUbUq` \YQ5W^4^_XQ5U^] sc aeUS_^\e^YTbQ cu] \cdot \] _c i Q_db_c S_^` QQRbqc c\r^cU^dT_' : ^\Q`bU\e^QQ% $\hbox{cU$'dDT_'QW'} \ aeUTUdUb] \ YQ\ Qf_e^dDT_4 i \ QS_^db_fUbcQc_RbUUcdU`e^d__ \ Uc\%Yce_TUdUb] \ YQSW^dD'U \ YWe^QSQecQ_ Ve^TQ] \ U^d_U \ U^c_U \ U$ QRc_\ed_4`Ub_T_^TU\QRQcUTU_ aeU cUQ% QcUQU^\Qf_\e^dQT`b_`\Q%_U^_db_\eVQb Dub_cY_`bUdYTUcUb_ aeUcU] U^SY_^Q] sc QbbRQ% _gY6K_ed&=Qie^W6Q^beYf_`b_TeSYf_`_bU,`_TUbTU Qed_6TUdUdjYQ5Y6Y%6_]_YQV6U^dUTUd_T_c_cQ6d_c\Y8bUTU\Qf_ke^dQT3`Ub_SeQ^T_U\ $\label{eq:continuity} $$ Qe^1 \|WQQCUBUh'\|SQT_%Qe'W''MSQT_UE_eU''YWk'^_TUBU'QRC_eU_UE_QUBU''UTUUU_UC_CGU_CSU_C''YU, '_TUBTU QeU_TUBUJ YQS'W''YY $$$ $^{\text{YW}}_{\underline{0}}$ % $^{\text{YW}}_{\underline{0}}$ aeU ceb/V/ $^{\text{TU}}_{\underline{0}}$ $^{\text{QTQ4}}_{\underline{V}}$ $^{\text{QSQecQ}}$ $^{\text{YW}}_{\underline{0}}$ $^{\text{TU}}_{\underline{0}}$ $^{\text{YW}}_{\underline{0}}$ $^{\text{YW}}_{\underline{0}}$ $^{\text{QU}}_{\underline{0}}$ $^{\text{QU}}_{\underline{0}}$ g YM_ed&=Q! e^VMQ^beYT_`b_TeSYT_`_bU\`_TUbTU Qed_&TUbUb] YQSWY%6_]_\QV&U^dUTU d_T_c_c Q&d_c\YRbUTU\Qf_\e^dQT3`Ub_SeQ^T_U\ $\label{eq:continuity} $$ Qee^i_{MNQQ} = W^NKQT_MA_cNN^NKQT_UC^e_{MQ} CAL_{ed} Uc_QVeU^dU^UUC_c CA_{ed} Uc_QVeU^dU^UC_c CA_{ed} Uc_QVeU^d UC_C CA_{ed} Uc_QVeU^d UC_C CA_{ed} Uc_QVeU^d UC_C CA_{ed}$ g YM_ed&=Q; e^VMQ^beYT_ `b_TeSYT_ `_bU\`_TUbTU Qed_&TUbUd; YQSYW^%6_] _ \Q\&U^dUTUd_T_c_c Q&d_c \\P\UTU\Qf_\e^Ad\T3`Ub_ SeQ^T_ U\ Qce^d_\\\WWQQcUbUh`\YS

G^U] RQbW %LcdQ] Y:] QS cQ%^S\ec aeU\ c QSd c\\RbUTU\Qf \e^dQT c ^UfU^d c aeUf\\U^U^Q\ QcQbcY^ e^Q SQecQ%Jc%Y^TeTQYj`\uSYQU^\Q^SW^QdjY^Q^TU\Q\RUbdQTTU\Qf \e^dQT4Q`UcQbTU aeU cUb] ei Y'S ^c/cdu^du'S ^] eSXQc dtQc'S cQc U^ce UcaeU] Q% (tu' eW'Q^du `QtQQWe^Qc'S cQc')[`\u5YQc U^ce ^_SW^TU\/RUbaQT' Ge _`Y^W^}j`\\SQ%aeU\QTUbUj YQSW^TU\Qf_\e^dQT`Qb%Uc cY^^YWe^Q SQecQ4 `_baeU c_cd'U^U^_c Q&d_c \\RbUc TU \Qf_\e^dQT TU cUbQ\$_^dU\$\] \\U^d_c \$_^d\WU^dUc4i \$_^d\WU^\$\QUc UcU^\$YQ,`QtQ\Q\\RUbdQTU^ce^_SYw^TUU\\Q DUb_cY^TeTQ%QaeU\\QcS_cQcaeUdU^U^e^dUbbu^_Q^dUci\Q lbQ;w^TU.ceUhYcdL^SQ`Qbbe\Qbbe^QrdLSUTU^dUSQecQaeUTUdUbj YQaeUc ^% TUdUbj YQaeUc ^dQ\S] c_^%__SeltU^TU] Q^UtQS_^d^WU^dU GYQW_Q^dUbY_b%_be^QY^VeU^SYQSQceQi ltuc`USd_%

 $MTURNT_QaeUcUdtQtQU^] \ eSX_c \ Qc`USd_c \] \ ei \ Y_1 \ `_bdQ^dUc \ U^UcdQS_^db_f \ UbcVQ% \ QcUQV_c \ QSd_c \ VRUU \ TUVQf_/e^dQT \ c_^$

 $UfU^*d \ c \ aeU \ fYU^*U^*Q \ QcQbcY^*e^QSQecQ4M \ UcdQt \ U^* \ QddSeQbU^*U, \ UhQ] \ U^*TU \ UcdU \ ^e^d \ U^*QcT \ c \ cUSSY \ ^Uc \ cYWeYU^*dUc^!$

GUSSYi^ >>>

@\\RUMDTTTU\Qf_\e^dDTC ?_^QX\Q^^: Tg\Q\$TC

6 AUC TUU AUQUU SEQAe MUDTYSECYN C_RUU AU AU] QYJ U WECADAU UN'YSQDSWJ _ YRQQ CUD U AUTTJ _%EQAT_ ec_ \Q`QQRAQ D_baeUU VUCAU TYSebc_4i QaeU XQ XQAU U E QY QQRAQ U ZBWAU TU E QY QA LUU AU TYSEbc_4i QaeU XQ XQAU U E QY QQRAQ U LEW AUTTJ _ SQC YM TU E QYY QA LUU AU TYSEbc_4i QaeU XQ XQAU U E QY QQRAQ U LEW AUTTJ _ SQC YM TU E QY QA LUU AU TYSEbc_4i QaeU XQ XQAU U E QY QQ LUU AU TYB _ SQC YAU YWAU AU TYB _ SQC YAU YWAU AU TYB _ YAU _ YAU LU E QY QA LUU AU YWEU SQC YAU YWAU AU YWEU AU YWEU SQC YAU YWAU AU YWEU AU YWEU AU YWAU AU YWEU AU YWEU AU YWAU AU YWEU AU YWEU

D_b/_ dQ^d_%QfUSUc ec_ /Q`QQRbQ8QecQ%u^ucdQYfUcdMQSw/%QqQcMWYMSQbSeQaeYUbQYdUSUTU^dU%QcUQ^QdebQ,_]_bQ%
`_cYdfQ_ ^UwQdfQ%u^\QaeU e^UfU^d_%QcUQe^QS_cQ_ /QV_bl_Qi /Qc SYSse^cdQYSQc TU e^QS_cQ%TU`U^TUTUT]QrUbQ%aeU uc uc uc i /QbQ w^%QcUQU^ce d_dQ\fQT_U^`Qbdw%_baet uc%u^\ewQbTU_ aeU^_4_`_baet uc S_]_ uc%u^\ewQbTU_ S_^ddQb_4
_%u^_ddc `QQRbqc%seQaeYubQYdbUTU^dUS_^U SeQ, e^UfU^d_S_^WheUrStQ`_cYdfQ%_^' usdt_%eU buQ]U^d udu`ubdu^UQQ
bQ w^`_b/Q`b_`_cYSw/aeU QXdQQs_^cUSeU^SQTU_ddQS_cQ%aeU uc aeysc] sc RYU^e^Q_SQcW/aeU e^QSQecQ%XQR\Q^T_S_^] sc
`b_`YUTQT'

 $\label{eq:main_series} $$M_c_i U_i = C_i U_i = C_i U_i + C_i U_i$

 $\label{eq:mucdutsqu} \begin{tabular}{ll} M Ucdutsqut_SQ1 x^{\text{LUC}} & S_c(x) & Y_c(x) & Y_c(x) & S_c(x) & Y_c(x) & Y_c(x)$

@\\ruadot τ∪\Qf_\e^dot ?__^QX\Q^: Tg QbTc

GYUCUJ WKQ^` BYSYY_TU CUYOT_ S_I x^cUQaeYQT_ d_I _U QXWe] UY d_I TU\c UWSd_c Q\Qc SQecQc SUcQ% Qcud_T_U\S_^SI\YUY_d_TU SeQaeYUbUhYcUYSQ%QTU] sc TU_aeU dUYU]_c`_b\QY'deYSW^] sc TYUSQQUYY] UTQQQ%U^` QdaSe\Qbd_TQ^eUcdQ` beURQTU\Q UhYcUYSQTU9Y_c%SUcQ3QXWe] UYQI]_c Ge cUbTU ^eUcd_`b_`Y_c cut% U\c ubTU_ddc S_cQc%aeU c_^cUYcYR\Uc fUj_^ \every_\every_\text{U} fUj__c SQCWeU_\c_\cut \\ \text{U} \ \text{C} \text{U} \ \text{U} \ \text{C} \text{U} \ \text{C} \text{U} \ \text{U} \ \text{U} \ \text{C} \text{U} \ \text{U}

9UXUSX_%_ _QXKg|_%eeUUhYcdUU^\Q^QxbUQ\JQTU\Qc_S_cQc.cY^Ve^TQ|U^d_`QxQ\U,S_^Sf|YU^d_TU,GUbTU9Y_c%Y^^VVe^Q ^QTQe^YfUbcQii% bdQ^d%aeU^ XQRbqQ%Jv\Q^QdebQUjQTU\QcScQc%e^QRQcUTUUfYTU^SYQYdeYdfQ%aeU^ TURUcUbe^udUb^% %cub] sc`ubusd y~vn~vQ4cydefxtbg] c\QveubjQi [QS]`bu^cxw^Tu\Q] u^du cevvsvv^du% QbQdu^ube^QyTuQS\QbQTuRvu^ucdb U^SeU^ddQ^U^ce`b``\Q^QdebQU|QQRcebTQiS^ddQT\SdbQ4S] fU]caeUTciTcc^SeQdb4iS] fU]caeUe^SdbSe\ ^_ dtu^u s^we_c' Gydef Y: bQj _c e^Q YfuQ dQ^ S\QQUTU_c e^YfubcQ\Lc%L^M_YMYDQ QAEU du^uj _c LcdQc _ddQc S_cQc%e` _^W_ $aeUTURUbQ]_cfUb]_scYdeYdfQ]_UYdU_QRcebT_TU.ce`_YUbaeU.dQucGUbY_cUb4TURU.fUbTUYY]_UTQd_aeU.YQ.Uc`QSY_YdQQUcGUbY_Ub4TURU.fubTUYY]_UTQd_aeU.YQ.Uc`QSY_YdQQUcGUbY_cUb4TURU.fubTUYY]_UTQd_aeU.YQ.Uc`QSY_YQQQUcGUbY_cUb4TURU.fubTUYY]_UTQd_aeU.YQ.Uc`QSY_YQQQUcGUbY_cUb4TURU.fubTUYY]_UTQd_aeU.YQ.Uc`QSY_YQQQUcGUbY_cUb4TURU.fubTUYY]_UTQd_aeU.YQ.Uc`QSY_YQQQUcGUbY_cUb4TURU.fubTUYY]_UTQd_aeU.YQ.Uc`QSY_YQQQUcGUbY_cUb4TURU.fubTUYY]_UTQd_aeU.YQ.Uc`QSY_YQQQUcGUbY_cUb4TURU.fubTUYY]_UTQd_aeU.YQ.Uc`QSY_YQQQUcGUbY_cUb4TURU.fubTUYY]_UTQd_aeU.YQ.Uc`QSY_YQQQUcGUbY_cUb4TURU.fubTUYY]_UTQd_aeU.YQ.Uc`QSY_YQQQUcGUbY_cUb4TURU.fubTUYY]_UTQd_aeU.YQ.Uc`QSY_YQQQUcGUbY_cUb4TURU.fubTUYY]_UTQd_aeU.YQ.Uc`QSY_YQQQQUcGUbY_cUb4TURU.fubTUYY_gUb4TURU.fubTUYY_gUb4TURU.fubTUYY_gUb4TURU.fubTUYY_gUb4TURU.fubTUYY_gUb4TURU.fubTUYY_gUb4TURU.fubTUYY_gUb4TURU.fubTURU.fubTURU.fubTURU.fubTUY_gUb4TURU.fubTU$ \Q`\bU\\&^dQTU\cY\uc`_c\\\Uangle\uangle\an VėlugʻQi $[\mu,QSQ^SUTU]Q]$ Undu%QcQRUbucd cYnTeTQTUUcdQ] QnubQYdeYdfQUYTU UnTYUndu% Ub_U,SQI Yn_aeU,QXe] QnfQT] e^T_%UXQSU^S\QQQ U^dUfYYR\U44YU^T_U^dU^TYTQc`_b\QcS_cQcaeUc_^XUSXQc4ce UdUb^_`_TUbi TUTTQT' Db] Ub_ QCSU^TU] _c% TU] _cdtQbQ`_cdtQb_0%_TU_c U\USd_c%aeU^_ TURU cUbe^QSQecQUtUb^Q4i U^cUWe^T_ \eVtQb%TU] _cdtQb] UT\Q^dU \QQXMe] U^dQSM^%_\QY^de`SM^%eU UcdU GUbTURU cUb^USUcQXQ] U^dU Un'xdU^dU4i \eUW_dUSY_c%TU\Q^USUcYTQT TU]_cddQTQTU ce UnYdU^SYQ%aeU`eUTU^TUcSU^TUb% TU[cdtQbaeU] eSX c TU cec`UbWSSY ^Uc Q`bY bY

 $\begin{aligned} & \text{DUb_cYe} \land \text{Cyli} \ \text{aeU} \ \text{UcdU} \ \text{WQ} \land \text{brSYY_TU} \ \text{cU} \land \text{dT_S_]} \ \text{x} \land \text{cUbQRQ} \land \text{T_QTQ} \ \text{aeU} \land \text{uc} \land \text{Uc$

+2

:\] \text{'] _`brsy' aeU _c \\UrQQTudud \rangle \text{'e^QSQeCQ%_c \\UrQQTudud \rangle \text{'e^QSQeCQ%_c \\UrQQTudud \rangle \text{'e} \text{'e^QSQeCQ%_c \\UrQQTudud \rangle \text{'e} \ $\verb|\colored|| \ensuremath{\mathsf{CUTUXQRUb}}| \ensuremath{\mathsf{ScU^UU}}| \ensuremath{\mathsf{UMSd}}| \ensuremath{\mathsf{aeUU^Q8QecQ}}| \ensuremath{\mathsf{Gill}}| \ensuremath{\mathsf{GeVTURU}}| \ensuremath{\mathsf{UMSd}}| \ensuremath{\mathsf{VMSd}}| \ensuremath{\mathsf{aeUU^Q8QecQ}}| \ensuremath{\mathsf{Gill}}| \ensuremath{\mathsf{GeVTURU}}| \ensuremath{\mathsf{CUTURU}}| \ensuremath{\mathsf{UMSd}}| \ensuremath{\mathsf{GeVTURU}}| \ensuremath{\mathsf{CuCUTURU}}| \ensuremath{\mathsf{UMSd}}| \ensuremath{\mathsf{GeVTURU}}| \ensuremath{\mathsf{CuCUTURU}}| \ensur$ ^_ cw__du^u] _c ^^\e_q` beurqtu \qGubtu 9\c% ub_ turuj _c ucdbc\^ uf\fu^Sqtu\quhcdu^Sqtu\Seqae\ubS_cqaeUcuq% ub_ ^eucdq `b_`XQV_B|QY^]UTXQXD`BUCU^XQDYBUQcil (QS_^SYV^SQ DQQQ^_dU^U)_cV_B|QTU`b_RQbSeQaeYbbS_cQ%Ub_S_^U\QbWe]U^d_TU_cWb&d_cQ $\parbox{0.5} \parbox{0.5} \pa$ S_cQc%QbMe]_U^dQ]_c_ddQcS_cQc%TU\caeUTU`U^TU^%6_]_\cullsdcc_RbU\QcSQcQc\'>\lbhj_c\QUhYcdU^SQ`\QcQTQTU^c_dbc]\till_c% _ SeQaeYUb_ddQS_cQ%_b\Q] U] _btQ4cw_S_] _ QbMe] U^dQ] _c%aeU\Qx YTUQc%aeU QX_tQUcds^U^^eUcdsQ] U^dU%c_^\Qc S_^cU5eU^SQc TU\Qc _ S_^_SU| _c _dloc S_coc c_V0| U^dU`_b] UTY_TU+cd_c%6_) _ ^USU-cQbO| U^dUS_^USd0T_c S_^_db_c% TU U^TU^TUU_c' DUb_ cYQc S_coc $\verb|`eUTU^`UcdQbcy^`SQecQc%d_TQUcdQS_^UhW^i| TU`U^TU^SQ^USUcQbQcUTYceUfU% Qcud_T_c \setminus_c] UTY_c TU^eUcdb_S_^Sf YU^d_cUXQYT_' McY$ $\begin{tabular}{ll} QRcebT _ TWSe(dQTU^ce`_^Ub/Q] Y: QTU] Y(_^Uc TU] Y(_^Uc TU] Y(_^Uc TU) Y(_^U$ TWSe/dQT3^QTQ] e\d" \SQT_ `_b^QTQ%_ Qe] U^dQ\Qce] Q M%U^UUSd_%TU QSeUbT_ S_^\QXY wdU^\c TU aeU Ucd_i _ `_^\UT_%TU_c Qsd_c TU\Q `b_TeS1bUcdUdi'_TUUKU5d_c%1VJ`bUi SeQ*T_Uh`cdQU,QWU^dU% S_^\QVU5eU^S1QaeUdU^U_SQxW^GYQcu\&UdQ%aeU\Qc S_cQccw_TUe^Q $SQcUMQcQRUbQSd_cTUQf_e^0QT%QbUSQ^NUMQbQ^QcQbTUcu]Yc]_c4icUdbQdQbQTUe^0UfU^d_aeUUdQS_dfeQ%aeUXQ^QcQT_U^e^$ Sebc_%_c ce**Z**bd_c Q\uT__^TU cU U^S__^bdQb_^SQ` QSUc TU dQ\uc UFU^d_c4Ucd_] \text{\texi}\text{\te\tinte\ta}\text{\text{\text{\text{\text{\text{\text{\text{\text{\ $e^{Q}WWQ^{T}WUUSQUUSUUSUUFU^{d}\underline{i} \underline{d}\underline{c}\% \ aeUU^{L}UQWTQT \underline{\frown} \ ceSUTUTU] \ Q^{U}QS\underline{\frown} A^{U}W^{U}UDQQS\underline{\frown} A^{U}W^{S}QUUSUUSUUSUUW\% \underline{\frown} \ UUS\underline{\frown} WUbi$ f\underline{t}\und $XY_{i} = ^{Q}WW_{i}^{T}W_{i}^{T}W_{i}^{T}W_{i}^{T}W_{i}^{T}W_{i}$ $SY_{C}^{Y}C^{A}eYUQQWeQ\% \ aeUUc\underline{d}\ fYU'UcQ^Q]\ U'eT_\%Q^{S}_{C}^{Q}UU QR^{Q}U \ QRe^{T}Q^{Q}U^{A}U^{A}_{Q}T_{Q}U^{A}$ $XY_{i} = ^{Q}WQ^{T}WUU^{S}QU^{d}UU^{U}U^{d} i _{0}c%$ ae $UU^{U}UQWTQT ^{c}cSUTUTU]$ $Q^{U}QS_{0}CWU^{Q}UU^{Q}U^{C}QS_{0}CWU^{S}QU^{C}SUW_{0}^{S}$ f\underline{\text{f\underline{g}}\cute{\text{c\underline{g}}}\cute{\text{c\underline{g}}}\cute{\text{c\underline{g}}}\cute{\text{c\underline{g}}}\text{TU}\underline{g}\text{TU}\underline{g}\text{TU}\underline{g}\text{TU}\underline{g}\under $SV_L c\%'Y c\%eYUbQ QMeQ\% \ aeUUcd_fYU'U dQ^Q] \ U'eT_\%D'S_^cdQ'dUi \ QRe^TQ'dUNU^d_L T_U,] \ e^T_%U'd_TQ_V UTQTUc\% \ eUcdtQ aeUUhYdUi \ QRe^TQ'dUNU^d_L T_U,] \ e^T_%U'd_TQ_V UTQTUc% \ eUcdtQ aeUUhYdUi \ QRe^TQ'dUNU^d_L T_U,] \ e^T_%U'd_TQ_V UTQTUc% \ eUcdtQ aeUUhYdUi \ QRe^TQ'dUNU^d_L T_U,] \ e^T_%U'd_TQ_V UTQTUc% \ eUcdtQ aeUUhYdUi \ QRe^TQ'dUNU^d_L T_U,] \ e^T_%U'd_TQ_V UTQTUc% \ eUcdtQ aeUUhYdUi \ QRe^TQ'dUNU^d_L T_U,] \ e^T_%U'd_TQ_V UTQTUc% \ eUcdtQ aeUUhYdUi \ QRe^TQ'dUNU^d_L T_U,] \ e^T_%U'd_TQ_V UTQTUc% \ eUcdtQ aeUUhYdUi \ QRe^TQ'dUNU^d_L T_U,] \ e^T_%U'd_TQ_V UTQTUc% \ eUcdtQ aeUUhYdUi \ QRe^TQ'dUNU^d_L T_U,] \ e^T_%U'd_TQ_V UTQTUc% \ eUcdtQ aeUUhYdUi \ QRe^TQ^D_U U'AUN^d_L T_U,] \ e^T_%U'd_TQ_V UTQTUc% \ eUcdtQ aeUUhYdUi \ QRe^TQ^D_U'AUN^d_L T_U,] \ e^T_%U'd_TQ_V UTQTUc% \ eUcdtQ aeUUhYdUi \ QRe^TQ^D_U U'AUN^d_L T_U U'AUN$ $QWe^{Q}SQecQ_{QUQ}W^TU/QSQITQTUU,QWeQWeUbQTU_cSU_c4i \ aeUQW_] \ sc \ aeU/Q] \ UbQS_{dr}Wb^{S}Qdb^{U}e^{Q}] \ Q^U/Q] \ QUbQ'i \ ^_US_{Wb}i \ UUMbe^{d'__}i \ ^_UcS_{Wb}i \ UUMbe^{d'___i}i \ ^_UcS_{Wb}i \ UUMbe^{d'____i}i \ ^_UcS_{Wb}i \ UUMbe^{d'____i}i \ ^_UcS_{Wb}i \ UUMbe^{d'____i}i \ ^_UcS_{Wb}i \ UUMbe^{d'_____i}i \ ^_UcS_{Wb}i \ UUMbe^{d'_____i}i \ ^_UcS_{Wb}i \ ^_U$ @\\ruadot \tau\\qf_\e^d\tar

6`ucqbtUaeU]eSX c] \\ ^uctU]\\ ^uctUS cqcfU^qQ^Q\QuhcdU^SQTUUcqQ]Q^ubq%dTQ\Q\Q\TU\Qdbbq%dtQ Uh'cdu'SQ: ^e^SQTURU VQ\QbQceSUTUbT ^TU XQ Uc`QSY `QbQU\\ c% e^ceZbd SQ`Q TU U\\ c% aeUS ^cdQ^dU] U^dU% SQTQFU; aeUXQ; SQcYv^GY^QTNUcUY; QWnQxXQ; QW U^U,dY TUUFU^d aeUXQSU` cYR\UaeUcU\\UM&UQUhXdbcYce^Q SQecQ% TURU TUSY%eU\ c QSd c \RtuTU\Qf_\e^qQT c_^Un\cdu^SQc TU SQts Sdubce` UtY bT\VUtU\dUTU_dtQc S_cQc4U^bQ; w^ $TU aeU`eUTQ^* \\ UMQbQUhYcdbcY^^YVMe^QRQcU_bQ w^TUU\\ QQ^* UbY_b \\ Qe^aeU_ddQc S_cQc ^_`eUTUBcYXQSU^*UcdQ_RZUSYw^* \\ UCdQ_RZUSYw^* \\ UCdQ_RZUS$ TUfUbQc%UbQe^QUfYTU^SYQTUceUhdbQvQ\fYTQbcUTUcu]Y:] c4`baeUU\\cuUcdQbQ^TQ^T SeU^qQTUQWTUdUbU^TU \Q\underline{\QS_cQ\%eQ^T_\%Q\]\tau_aeU]_ cUvQQt%aeU\Q^QdebQUjQ`Q`dbbQUjQ`T\WUdU^3QVT\WUdU^dUTU\cTU]sc%eUTU`^Ub^YVW^ \&^TQ| U^d_`QtQUcQS_cQaeUf\YL^UQ\QUh\tdU^S\Qc\^e^QSQecQ4TURYT_Qce`_^UbUcd %UbQce`_^Ub\Q ^QteUQ\J Q `QbdSe\QbTU\QUhYcdU^SQTUe^QS_cQQYdUcTU\QUhYcdU^SYQ%``_b_dQ^d_QW_aeUTQ`Qc_Q\QUhYcdU^SYQ%cY`e^QSQecQ_ kg w^TU/QUhYcUrSQ DUb \ aeUU^^YVk^Qc`USd %TUQ`Qc_Qe^QS_cQaeUfYUrUQ\QUhYcUrSQ%`_bSeQaeYUbV kj_Q SYSE^cdQ^SQTU_ce`bij_UtQUh'xdU^SYQ%TURU%UbQ^tUbY_bQ\QUh'xdU^SYQ:\SQtsSdUbT'xd^df'_TU,UVUSd %aeU_Uc QW_aeU `UbdU^U5U Q, UNU5d_%_ `eUTU dU^UbY^VeU^SYQ XQ5AQ Qbbsc% QbQ Q5deQbQ^duc TU aeU cUQ'@Q`U5e(\Qb^QdebQkUj QTU UcQS_cQ \\Q| QTQEeUbub%``eUTU XQSUb^QTQ%``eUTU du^UbYNeU^SQ%| YU^dbQcaeU^\\Ue'MTuc`et cTU aeU cUQTU| Qc\QT dbTU`QuQaeUce YYkeU^SQ% baeUU^d ^SUc \QS cQcUXQQcUMebQT i QTU\QUhYcU^SQ%Y ce Qi eTQ

6cuaeUTUXUSX_ Uc dQ^bU`eWQ^dUQ\Qbd; w^%e`_^UbaeUe^Qsd_TU\Qf_\e^dQTTURU\\UMQbQUhYdbcY`e^Q\$QecQ%6_]_` QdQ ce`_^UbaeUU\Q] QXe] Q^Q%_e^s^WU%_U\W_R_TU\QdUbbQ%_\Qdd\TQTTU\e^fUbc_%TURU\\UMQbQ\UhYdbcY`e^Q\$QecQ%6_]_` QdQ eQ\TQTTU\e^fUbc_%TURU\\UMQbQ`QhYdbcY`e^Q\$QecQ%6_]_` QdQ eQ\TQTTU\e^fUbc_%TURU\\UMQbQ`QhYdbcY`e^Q\$QecQ%6M__Q McY e^QfUj aeU`Uj \dj \qq \c \updatus \upda

GUSSYu^ * '

$@Qf_\NSY(A^*) = V(A^*) + V(A$

@\\#Uadot \to\Qr_\e^dot \ ?_^QX\Q^^: Tg\Q\$Tc

`_buc_\\uwqQceSuTub_`_`_baet_ucTu_ucdQ] Q^ubq\\u^\eWqbTu_ddQ Dub_c\^TeTQucduQed_b\\u^\ucdQ] Qdubq\\tu\qubQ\tu\cub] ei TucSe\TQT_i ^ \rangle \quad \text{vdu^SY ^QTQc' D b\\

, 'I ^cubqsdf_`eutiu ddqubuvusd_c tu', 'qcqb`_bce qsdfffqt% ub_'_c_^S_]__S_^cuseu^Sqtuce qsdeqsw3cu`b_tesu

'Qtq`_bce qsdffqtyfu_db_]_t__aeu`_bu\uzubsfs_tuce qsdfffqtw, '_b_dq^d_] sc aeu_c ved_c tuce uzubsfs_3aeu^_

Q`_bdq^qtqq` \cdot_be^qqsdfffqt \quivdu duu dub_u\uzubsfs_tuce qsdfffqt uc \qqssw4i`_buc_ce qssfw_wu u\uzubsfs_tuu

ce qsdfffqtyfuu-cubqyduby_bq_c uvusd_c tuce qsdfffqt \qqtvce qsdfffqt uc \qqssw4i`_bt_eq ce qsdfffqt uc \qqssw4i`_bu__ub__uuzubsfs_tuu

ce qsdfffqt uc fuccqt_%vuxt_ u\uvusd_tu\ved_tuce qsdfffqt \qqtvce qsdfffqt uc \qqssw4i`_bt_eq cubwfu\qaeuce

qsdfffqt uc fuccqt_%vuxt_ u\uvusd_tu\ved_tuce qsdfffqt \qc exsdfffqt tuc ex \b_`y__Rzud_% ce qsdfffqt uc fuccqt_c Rbucu

Turucuweb d_bb_aeuturucus%_b\q] \cdot_d \cdot\

@(\RubatT TU \Qf_\e^αtT = ?_^QδKQ^: Tg QδTc

- 'E EU LI Q] QNQ `LCQSTU e^Qcecdy SQQSdf Q%_ ` eUTU Tri Uta*WSQbcec ` b_ ` Y_C QSd_C%Y_ `_bNQ ` bi] UtQQSdcQSW4_cUbe^Q SQcQTULLId] YQ^dUTU TWULU AU QSd_C%_SeQULcae*UtQUUUSd_C TWULU AU WG UUSU TU e^Q SQCU% QFUSUL TU_ddQ%TU_db_] _ T_ aeU S_] _ S_ ^ LUSeU^SQQTU cec ` b_ ` Y_C QSd_C Tri Uta_C%LU `_^UTU] Q^WUCd_ `_bUcdQAaeU cYUc Qcu%LYd_SUL VQ] Y;] QSQccQWQ] Y;] QYWeU^SQSccQ\cap{C}\cap{C

.'Ge`_^W0]_c%QaeU Lcd_cdu_W_cXQSU^%aeU ^_ Un\cdu^QSd_cTU\Q]_Q%J^cU^dT_ LcdbSd_% Ub_J_\\SY_^Lc\\Rbuc4Q S ^dreQSW^%u_cWeUaeuu,Q] Quce^cubQ5df U^^QTQ] sc\UZcTu\ aeuuce^cubf \e^ddbQ UuSdfQ4i SeQ^T SQTQfuj aeU`b TeSUUWUSd c TUV bj QQSdfQ% b TeSUUWUSd c f /e^qQbQj U^dUi TUV bj QU/USdfQ DUb `QbQ`b TeSNbUWUSd c ` b/ dQ^d %bc $\text{W,] Y_{c}]} = \text{aeU' QQQ' b_TeS'bUNUSd_c U' S_^cUSeU'SQ% TU QSeUbT_ Q ce 'b_'YQ UUUSSW'' M cYUL QCUNUYC QCUNUYC ACUNEDQ U'AU U, Q,] Q^_ \\$ `_bce QSdfYTQT`b_TeS1bd_T_c cec`b_`Y_c QSd_c TU\Qf_\e^qQT__TU\QU\USS1w^Qcu]_\t]__c4`QxQ\Ucd_%_b\Qce`_c\SYw^%\uc`b_TeS1b $\underline{d} T_c \csc QSd_c \ \ \ \ TU U U SSW^f_k - \alpha QSQ_i \ TU V U Q QUUSAFQ_S_] \ _ S_C U SeU^S Q TU cec `b_`Y_c QSd_c \ \ \ \ TU U U SSW \%_aeU$ UNUFQU/Qce^d TMUSAQ] U^dUQ/QS ^dtqTnSSW^Q^duc] U^SY ^QTQ%TUe^QSd \\R\UTUU\USSW^Q^ducTU/Q`bij UtqS ^Unw^QSd TU $\label{localize} $$U_{\lambda}^0 = X_{\lambda}^0 - X_{\lambda}$ `b_TeS1b_%Q] U^dU^_ Uc\QSQecQf_1e^dqbqTUUcQf_\YSW^4`_baeU^_ cebWUTU%YUcds bUWe\QTQ`_b%QU\USSW^_ U\TXUV_' M`_b _dQ^d_^_`eUTU.cUt%aeU.\Q] U^dU.TURU.cUb.\QSQecQ.Q5df.Q%f_\e^dQ\$AgXQTUdUbj Y^Q5Yw^TU\`bfj Ubi `bY^SY.Q.f_\Y5Yw^aeU.cU $\texttt{bUQSY} \land \texttt{QS} \land \texttt{VQWQMS\&@}] \ \texttt{U} \land \texttt$ `UdjYdbsaeUcUQ\QSQecQU\TY6Uv_TUdjT_ccec`b_`Y_cTY6Uv_c'@Q]U^dUUce^QSQecQU\U5dfQ%;U`UdjYdbs`b_TeSY6UVL5d_ccw_ S_{-} S_{- `b_`YQ: U\USSY_^Uc4i QaeU ce`_^U e^Q U\USSYw^ Q^dUc TU \Q`bYj UbQ U\USSYw^ 6cv8\Q] U^dU cYU^T_ e^Q SQecQ QSdfQ\U`Udj YdU `b_TeS16UNUSd_cU^S_^cUSeU^S1QTU.cec`b_`Y_cQSd_c%\Ub_^_cU`Ud]Y00saeUcUQ\QSQecQTUdUd]Y^Q^dUTUd_T_ccec`b_`Y_c QSd_c4`QbQUcd_Uc%TU\Q] Yc] Q] Q^UbQ%e^QS_^dbQTY\$SYW4i QaeUce`_^Ue^Q\$d_TUbUb] YQbfUbcQT_ c_RbUU\`bij UbQ\$d_% Q^duc $TUt \ensuremath{\mbox{\sc httd:}} \ensuremath{\mbox{\sc httd:}}$

B_`eUT_S_^SURYb^QTQ] sc aeU cU`eUTU TUSYbS_^U, Q] QaeU dU^U`_TUb`QtQ SQecQbi TUdUd] YQbcec`b_`YQc f_\YSY_^Uc% S_]_ e^cUbQaeYU^9Y_c XQTQT_ e^`_TUbTU QSSW^% Ub_ Ucd_4aeU 9Y_c XQTQT_ `_TUbQ, Q] Q%Q f USUc%Q,] U^_c% QtQ UhSYQbJ_\YSY_^Uc U^ce`\QSUB%_TU QSeUbT_ Qce Q^d_Z'

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 $\label{thm:continuity} $$ MUCd_cYTETQce'_^U%U^d_T_cUcd_cSQc_c%e^QUUSSW^aeU'; LUSUTUd_T_cJ_\SY_^Uc aeU QcucUXJ_%^Sec_U, bJ_Uo_TUU_U_C'E eUTUCUJ R_SQU^U,] U^SY_^QT_WWQ^QCedT_'D_b/_dYd_%QQcdfYQTTUVQ^QdebQUJQTUQJQ_CTQb%U^L_J sc] u^J_% $$ Cec QRcebT_cUYS_^CXdUYSQC'$$$

GUSSYI^I'

GCUABEU CYGEIJ YYQYQVQVRUDDTTTUVQf_ke^DDT%BEUS_^YCXDUU^QTUUDUJ YWI CUWDQ^UWEQJ] U^UUY Ub_^ CUXQSU`_b`b_YQf_ke^DTTUVQSW^TUVQf_ke^DTTUCEC`b_YYC QEd_c%LU] QYDUWQ%W fYUZ QRCeBT_i VQS_^XDTWLADTTUVQf_ke^DTWLADTTUVQf_ke^DTTUCEC`b_YYC QEd_c%LU] QYDUWQ%W fYUZ QRCeBT_i VQS_ADDTSSW^TURU^CUb] QYDUYT_c%BEUSQTQQEd_\RBUTUVQf_ke^DTTUVQf_ke^DTTUCEC`b_YYC QEd_c%LU] QYDUWQ%W fYUZ QRCeBT_i VQS_ADDTSSW^TURU^CUb] QYDUYTUUQ QEd_TUUUJ YQCEC`b_YYC QEd_c TUVQf_ke^DTTU_dDQ] QYDQWBEU`_be^QEd_VRUUCUSWY TUUWD YQCEC`b_YYC QEd_c TUVQf_ke^DTTU_dDQ] QYDQWBEU`_be^QEd_QYDUYC TUUUJ YQCCC`b_YYC QEd_c TUVQf_ke^DTTU_dDQ] QYDQWBEU`_be^QEd_QYDUYC TUUUJ YQCCC`b_YYC TUUUJ YQCCC`b_YYC QEd_c TUVQf_ke^DTTU_dDQ] QYDQWBEU`_be^QEd_QYDUYC YQCCC`b_YYC TUUUJ YQCCC`b_YYC QEd_c TUVQf_ke^DTTUCQQQT YUQQWBEU`_be^QEd_YUUUSSW^S UYQCCCOXW \CDACATAQTI' MV_BEUUC \QQVYYQWX \CDACATAQTI' \QQVYYQWX \CDACATAQTI' \QQVYYQWX \CDACATAQTI' \QQVYYQWX \QQVYYQWX \CDACATAQTI' \QQVYYQWX \QQVYYQX \QQVYYQWX \QQVYYQX \QQVYYQWX \QQVYYQWX \QQVYYQWX \QQVYYQWX \QQVYYQWX \QQVYYQWX \QQVYYQWX \QQVYY

@\\rutator T∪\Qf_\e^ntor ?__^QX\Q^^: Tg\Q\$Tc

U, UNUSd 3i cYf \e^dttt00000 U^dU^ cUUUZbSU^U^U\(0,0\)%Swj Uc\(0,\)YRUbdtTTU\(0,f\)\e^dttTUZbSYTQU^\U\(0,0\)

: cdU Uc U,fUBTQTUb_ UcdQT_TU/Q^_SW^Qd| Y^Q^_TU/Q\/RUbdQT%_c UcSbd_UUc aeUTUWD^TU^aeU cUfU^_R\/WQT_c QY^S_^c\/cdU^SYQ: Rbed_c%U^_ aeUT'SU^QSUGQTUUcdUdU] Q'DQQQUZU] $\ \$ %U^9B K XYRi 4t\%U^ce Tt'Sebc c RUU\Q\\RUbdQTTU\Qf \e^dQT%U $\ \$ ~UQ\Q \YY\\^TU\ c $SQf \begin{tabular}{ll} SQf \begin{tabular}{ll} SQf$ $\label{eq:market} $$ McY^U_1 = Q_X^0_1 = U^SY_Q_Q_Y_1 = U^SW^TU^W_0 = Q_1 = U^TSQT_TU_CU^T_1 = Q_1 = U^TSQT_1 = Q_1 =$ $\label{total_condition} $$\operatorname{Ucd}_{\operatorname{NLSMO}} \to \operatorname{Ucd}_{\operatorname{NLSMO}} : \operatorname{Ucd}_{\operatorname{NLSMO}} \to \operatorname{Ucd}_{\operatorname{NLSMO}} : \operatorname{Ucd}_{\operatorname{NLSMO}} \to \operatorname{Ucd}_{\operatorname{NLSMO}} : \operatorname{Ucd}_{\operatorname{NLSMO}} : \operatorname{Ucd}_{\operatorname{NLSMO}} : \operatorname{Ucd}_{\operatorname{NLSMO}} \to \operatorname{Ucd}_{\operatorname{NLSMO}} : \operatorname{Ucd}_{\operatorname{NLSMO}}$ $\verb|U^UVSd_\%_i| = TrSUt \\ $(x_i) = TrSU$ tUS ^ SU` bc b`tUcQS ^dtQcu] 't] 3` baeUcY\Q\\RUbd\T ^ S ^ctdUU^Ucd %aet dtQS cQcU`eUTUTYUV\QbaeUTURUS ^ctdbU^5 GYcU $TSU\%_{-}] _U_19BKX\%RiYcYcdUU^_db_kWQb\%eU^_S_^cYcdUc_VQ]U^dUU^Q/RUbdQTTUXQSUbV_aeUaeUbQ]_c\%cY_dQ]RYL^e^Q/RUbdQTTU/Q$ f_e^3 f_ke^dQT__aeU ^_c `\Q;SQ%\^`cUb\}``UT\T_ `_be^Q ^USUc\TQT S_^dQQbQ5__U^_dQC: `Q,QRbQc%e^Q\\RUbdQT `QbQU,Q} QU^ce T\ć`eUcd_c QQSdeQb $TUQSeUbT_Qce`b``QUUSSW75 Gt%Lbd_] \ `t]_U,] \ 't]_Qed b``QbUSU`Ub] \ 'tb'' \ 'ce`_^WQ]_c e^Qi_dbQfUJ \%h^U, ec_aeU XQSUTUTYSX. c TU$ TUSYLYW^`b_`YQ% Uc WKQdt``QxQaeU cUY'S\Y'U QSeQaeYUb``QxdUU\\QcUbs M_c TU?ecdr_ A statt94 @QT_SdbYQTU_c SbtcdQr_c Uc t cdU%eU _ cU XQSU^QTQ_ceVbWTUQSeUbT_S_^U,TUcd^_%Ub_aeUSQTQX_]RbUXQSUU,RYU^_U,]Q%QceUUUSSW^DFCD%6'MQ`QbbbTU:ecURY_%UcdQc `QQRbQc4 GYcUUcdQR\USUbs U\TUcd^_%QW(_c_\QQ`\UTQT c_^_fUbd\b_g ~&H_TQc UcdQc S_cQc%TU U^TYU^T_TU\Q ^USUc\TQT Ydb_TeSYTQ`_b \Qc. UcdU\\Qc%_U^f_iQdc_RUU\Q]UTYQGYV^i`b_SUTYU^T_UZUGSY_TU ^eUcdQcU\USSW^DFCD%'MTU ^eUf_%Qc`QQRQcTUA6886F≯G4 \$k@_c aeU.cU.QSdew`_bU,: c`ubble GQ^d_%__cU\\Uf`Q^Q.SQR__RQZ_SeQae\Ub^USUc\fTQT% Ub_db/U^\\RUbbQT TU f_\f\UbcU.Qcu] \text{'!} _c% XQ\\Q^_ $aeUaeYUbQ^*U^*UcdQfYTQ' @QT_Sdb^QTU\\ c SbbdQ^_c Uc t cdU%aeU ^_c UXQSU ^QTQ_c eVbwTU QSeUbT_ $_^U, TUcd^_% Ub_aeU SQTQX_] RbU$ $\label{eq:control_control_control} \mbox{${\tt XQSUU,RWO_U,gWO_U$ UZUSSY TU ^eUcdQ cU/USSY/ DF C D>6' M TU ^eUf %Qc `QQRbQc TU A 6886F≯G4 9Y c% QbQ `bUcUbf Qb\Q\RUbdQT TU\QF \e^dQT TU,X] RbU%eU $\label{eq:ceviliance} \mbox{ce SeUb'$_Q$]$_b$W$_aeU`$_T$_b$Q$_cU\UFQ^Q$Q$_R$U^-Q,]$_Q$_c$_aeU$_UQ$_dew`$_bU,:$c`$_d$_d$_cU\UFQ^QQ_R$_cU\UFQ^Q$Q$_R$_cU\UFQ^QQ_R$_cU\UFQ^Q$Q$_R$_cU\UFQ^Q$_R$_CU\UFQ^Q$_R$_CU\UFQ$_CU\UFQ^Q$_R$_CU\UFQ^Q$_R$_CU\UFQ^Q$_R$_CU\UFQ^Q$_R$_CU\UFQ^Q$_R$_CU\UFQ^Q$_R$_CU\UFQ^Q$_R$_CU\UFQ^Q$_R$_CU\UFQ^Q$_CU\UFQ^Q$_R$_$: ecuRY_%Lcdp: `QQRbqx4 GYcu UcdpR\UsUbs U,TUcd^_%Q\%_c_wQi \Q`YuTqT c_^_fUbdko_g ^&H_TQc Ucdp. S_cqc%TU U^TYU^T_TU\Q ^USUcYTQT Y^b_TeSYTQ `_b\Qc Ucdb

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GUSSYi^J >

 $6 \text{cuMuNQed_b'bij Ub'\Q^_] U^SY_^QT_TU e^U^cQi_c_RbU Q\NRUbdQT TU Qf_\e^dQT% S' \#D +: \%H \%+0'$ce`_^U\%aeU XQi] eSX_c SQc_c%U^U\aeU\Qf_\e^dQT cUTUbUbj \YQ^Y^_b] Q\UcdQb' b\ucdV^dU%Y$

@\\#Uadot TU\Qf_\e^dot ?_^QX\Q^^: Tg\Q\$Tc

//%0)%0,%0-'\$UcdJQed_bce`_^U] ei Uh`bUcQ} U^dJ\Qf_\e^QTU^] eSX_c SQc_c QcUbTUdUq\ YQT_`_b^YVk^]_df__U^QRc_\ed_% QSdxQU^S_^2ed_cY^]_df__]_df__CTU`bJVUU^SU'&6aeu] U_RcUbfQbQ8

*'@]\t]Qce`c\S\name(UcUXQSUQaeu%J^S\angle)T\SS\name(T\tusqQiTUtbSQQcu]\t]'Db\ce`au%J^UcdUWQAQtw6]U^d YTYWUUYdU4aeUUc\Q] Y:] QS_cQaeUTUSYbaeU\Q] U^dUdUYUe^Q`UUWUUYSYQ%Q,] Y:] _ dUJ `_%aeU ^_ dUYU ^YW&^Q `buvubursiq @ aeu cu urdurtu ^_`eutu cub%aeu \q] urdu uc yrtiyuburdu qrduc tu aeu \\uweu q.duruberq u\ussiwr% Xqcdqaeu XQiQe^Q`b\Ubb\rStQ4cY`TeTQ`QtQ\ucduQed_b^_cU\jiQMYwaeUdJ^Qe^QS_^do_fUbc\QS_^SeQaeYUb`Ubc_^QQ,ce`_^UbUcd_' 6TU] sc% QduSu cuto%TU XUSX %aeU\ aeU ce` ^U%uc &^ Uc aeU\Qf \e^^qQT U\YWU e^QS cQQ^duc TU aeU db % TU\Qc SeQ\Uc UC YTWUUU^dU Q?dUC TU aeU CU U.\WVU% Ub_ aeU \Qf_\e^dQT UC YTWUUU^dU SeQ^T_ CU U.\WVU4i aeU CYU^T_ TU_db_] _T_ aeU $QWWQTQR\U aeU\Q _dtQ\%ebWU TU ce U\USSYw^i QXUSXQ Gec `QQRbQc c _^\%dDsW,)'$ T_^TU_c _RZUd_c aeU cU `b_`_^U^ `QbUSU^ `decoration of the control of the con$ YMAQJU^YUJU^YUJQ Q_RYU^%Qf_\e^aQTcUTUZQcY`WAuQ_TYUSG_b4i`_b_dQ^d_TURUdU^Ubce`b_`YQU\USSYW^%_bce`b_`YQ TUDUB YQSWY4aeU cUQ`b`YQ] U^dUe^` TUbTU Qed TUDUB YQSW' MU^dQUc SQc c\Qf \e^dQT\ XQSUS] cY\eUtQ Q XQSUb e^QReU^Qcu] 't`] _ `_bce `b_`YQ.UUSSYw'%lic TUSYb%6UQce `b_`Y_`\QSUb_ TU\UXUU U^ UcdQQed_&U\UXIT_ RYU^ 6cuS_] _ e^ X_{-} RbU QWQbbQ^T_ Qe^`e^d_TU\QdBbbQTUc_Se`QTQ%U^e^`Qc TUcXQRYbQT_%QXQSU cei Q\Q`_cUcYw^i \Q`b_`YUTQT% S_] _ $dQ_1 = U_2 = U_2$ S ^c\text{TUILQTQcw\} U^cu] \tau_\QSUbaeU cUc\text{YU}dUaeU ceb\text{WUTUce`b`\QU\USS\w^\% ce S ^cd\text{Q\SQU^\U\] \tau\} 'B c U^SQ^dQ] eSXQc S_cQc aeU XU] _c U,UWfT_% cw_ `_baeU_c U,UWf _c '

: cd_Uc_dQ^d_S_]_TUSY%aeU`bij_Ub_S_] U^j_Qj_c_Q`buxUbb] eSXQc_S_cQc%cjj_`\Uj_U^dU`_baeUXUj_c`buxUbt_i U\uvvt_U_c

RUV_bU & cdQc_S_cQc_TURU^cUbTYSXQc_^UbUcYfQTUc_cY^S_^cYTUbQSW^TUUcduQed_b 8X_YSU__`buxUbU^SQ^_`eUTU^cUbQ^duc_TU_cu

] Y_j_U^\Qj_Y_j QYcdQ^SQ% QcUQU^U_bTU^TU\dXUj_`__TU\Q^QbebQUjQ8B_`eUTU_cUbU\Ve^TQj_U^d_TU\Qj_Y_j Q%_\Q

S_^cUSeU^SQTU_cuj_Y_j_': \QSd_j Y_j_TU\QU\USSYw^TU_e^QS_cQU^\eWQbTU_ddQ%U`bUbWbYT_UcQS_cQ% aeUUcds_YYYSQ^T_e^

fQ_bce`UbY_bU^\LcQS_cQ_DUb_aeU\Qj_U^dU\cdQR\USU_e^fQ_b] sc_Qd_U^e^QS_cQaeU_ddQ%_Uc%u^`bij_Ub\eWQb%u\Vbed_TU_ce

YYTSQ^T_e^fQ_bce`UbY_bU^\LcQS_cQ

CSG_TU/Q

CSG_TU

@\\ruadot tu\qf_\e^dot ?_^QXQ^: Tg QbTc

 $D_b = \frac{1}{2} \frac{d^2 + d^2 T}{d^2 + d^2 T} \frac{d^2 C}{d^2 T} \frac$

In / c sedite v canared notes for in annotanistan notation and cardinate in provided in the control of the cont

?_^QdKQ^: Tg QbTc

\Q]U^dUTU`bSUTUb#Qe^aeUdT cUXQMQ% bQcuTUS%\%J^e^]]U^d\$:\`bijUb`Qc UcceTUdUg\YQS%^WU^UbQ,TUaeUfQQ $\underline{d} \ S C be \ ^Q T U \ / Q \ \ C : \ \ / \ C We' U \ \ U \ \ C \ \ U \ \ \ U \$ dUSUbi x/dj `Qc Uce^QTUdUdj YQSYv^`QddSe\QbTUd SQbe^`e^d TUdUbj YQT YYTYYTe %^S\ec UcQ`\Qj Q%eU% bUcUdY TU $QSSTU^du = UQ] U^du XQQQ^* QT_c = RUYU^L UXQ_VUYQT CU XQ_VUUSYT_] sc Q\\ S TU_do_c' 6X_LQRYU^\UVU XQ_VU USYTU^du = UV^\UVUYUVU USYTU^U USYTU^U USYTU^U USYTU^U USYTU^U USYTU^U USYTU^U USYTU U$ $\label{local_local_local_local_local} \begin{picture}(10,0) \put(0,0) \put(0,0)$ YSUNOK `bu` "TUKQNOU 6culuc U^U, 'bij Ub`qc %QTUOUGj YQSW/WU^UbQ,TU\Q] UNOU`QQQd Sqbe^ TU\ c cUcUndqi SeQbb `e^d c3\Q] U^dU^ Uc QRc \ed0] U^dUY^TKUKU^dUcY\ XQSU ^ 4aeUcUY^TeSUQaeU%U^QtQc TUXQSUbQWk^Uh`Ubi] U^d %` bU\ TUcU TUe^Q| WW QWk^ db] df aeU`bUfQUSU 6cuUc U^U,cUWe^T `Qc %Q] U^dU\QTUdUdj Y^QSW^TUTQbU^cuXQcdQ QRc \edQ] U^dUYTWUbU^dUcYcU`b SUTU` bUcdQbUvQQ ^ 4`Ub \ U\WVV% baeUQ`QbUSUU^UcU]] U^d e^bUSebc S ^fU^YU^dUi ~USUCQXY S ^U, VY^TU.Se] `\YbS ^U,`b`wcYd WU~UbQ\ M\] Yc] SebbU.U^U, dUbSUbi x\Xf] `Qc %aeU.Uc TUdUdj YQ^dU`QbQd SQb LCU`e^d_YTYfYTeQ,aeUbUQ] U^dU`bUfQLSUU^fYcQTU\Q] U^dU @Q] U^dU^_ LC YTYUbU^dUS_^bbc`U5d_QLcdU4cY_aeU Lcds Q`QdJSWbJaeYYd% \\\equiv \\notin \quad \qquad \qq \quad \qua $SQc_Qcui: \Delta Ue^QcUbUTU_RZbd_cQVQfYbdQ%e^fQQ`bufQUbUbU^U_Z\%U^VQYTUQ%fscQNsTU_cTU] sc'8eQ^T_dU^U]_c\setminus cTU[SQC_Qcuis AUU] sc'8eQ^T_dU^U[SQC_Qcuis AUU] sc'8eQ^T_dU$ $_$ Zc QRYUbd_c RQZ_U\c_\S\Qb_%| eSX_c_RZUd_c cQdQ^Q\QfYdQQQQfYdQYQfUj %JY^e] UbQR\Uc Yj sWU^Uc `eUTU^cUb`YYdQT_c Q\QfUj U^U\Q `b\ cbQ cTU\Q\ej4`Ub_\QQdU^SW^TU\Q] U^dU^_ uc\WeQ,QfQbY_cTUU_cQ\QfUj4_cYuc_`_b_aeU`QbQS_^dreQbU^ $SeQaeYub] = U \cap \underline{d} \cdot M \setminus \underline{1} \cdot \underline{h} \subseteq SetbuS - \underline{h} U \cap \underline{h}$ $QQfYdQTUQ]U\Delta UiQ \Delta WSQSWAQQGU4Q14Q1U^c$ QUU^c QUU^c QUU] e^T_] sc aeUfQbQ\$_^cdQ^dU] U^dU%aeU\Qc YTUQc TU\Q] U^dU4^_ cU aeUTU^ UhQ\$dQ] U^dUU^U\] Yc] _ UcdQT_ TebQ^dUU\] U^_b SQI_RYic ceSucYi_c Tulicec `b `noc YTUQc! D_b/_d0nd %_nontage aeu l/oc `utsu' SY nuc Tulio]_Undu `utaj_0nusun utage (utsu) undu un un] \t\] _ UcdQT_\%_ Un\tdU e^Q_^\\\deta\T \ UdSU\ dR\UTU d\U] _\%_baeU \XQ\ ceSUt\\^c\U^c\QdQ\U^\QRc_\ed_'

 $8_]_\c QSd_c TU\Qf_\e^dQT\%J^SQTQ^C_TU,\b_SUTJ^YU^d_QYdUbY_b]\ U^dU]\ U^SY_^QT_\%_fYU^U^Q^CQD cY^e^QSQecQ^C_CU^bUJ_GUBY_bU_aeU U_QSSTU^dU% S_]_\c QSd_c TU\QSG_UC TURYT_Qe^QYTESSW^`bUT_] YQYdU4^b_bb_aeU U_QSSTU^dU% S_]_\c XU\QJQT_\@_\c SeQaeYUbS_cQaeUfYU^UQ^C_S_cQc_YS_]`bU^cYR\Uc\QQQaeU\Q] U^dU U^\QSSTU^dU\% \\ _bU\aeU cU We\Q\%_UC SeQaeYUbS_cQaeUfYU^UQ^C_CQbcY^e^QSQecQ^@Q] U^dU U^\QTUdUbJ YQSW^TU cUb We\QT_`_bU\Q\%_Ucds TUdUbJ YQTQ^_bQW_aeU^_dUU^USQecQ4SeQaeYUb] sc aeU cYcU TUdUbJ YQ^C_QbcUb We\QT_`_bU\Q\%_UCds TUdUbJ YQTQ^_bQW_aeU^_dUU^USQecQ4SeQaeYUb] sc aeU cYcU TUdUbJ YQ^C_QbcUb We\QT_`_be^QWbQ^SQ^ATQT\%_\QVe^TSW^TU e^TQT_'D_baeU Qe^aeU U_TQT_SQUTU_] Q^UbQQSSTU^dQ,Q cUb_aeU Qbb_ZQ\%^YUJ_RQbW_\%YYWe^_fQQce^_UbaeU^_XQ e^QSQecQ^_b\QaeUSQUS_]___XQSU_@_c SQJ_RY_c Yf_\e^AdbY_c U^\QceSUc\w^TU^eUcdbQc \TUQc\Qe^aeU\QSQecQ^_cU^eUTU_RcUbfQb\%dU^UbdQ^d_e^QSQecQ\%$

@\\ruadpi \tu\qf_\e^dpi \ ?_^Q\$\Q^: Tg\Q\$\Tc

 $= Qi T_c S_c Qc U^Uc' USQ%aeU c_^' \underline{b} RQRVU] U^dU VQc_S QcY_Uc TUS_^' \underline{e}cYw^U^U, U^dU^TY] YU^d_TUV_c aeUYcYcdU^U^aeU% QdQ aeU VQ f_\e^dQf Qsdk QU^e^QY^TYddu^SQ QTUSeQTQ% cY^cUb]_f YT_' \underline{b}^YWe^_TUV_c YSU^df_c%u^^c coc Tudud] YQSY_Uc U^_c SQc c aeU cU XQ^] U^SY^QT '$

*':\<u>\</u>c`Q&BU^S_^\$_^\$^TbU,`e^d_U^SeUcdW^%_Q,]U^_c^_`QQQ]Q^UUU__SQQQ}U^UUUQ\QfYdQ_@Q`BUW\$^QQaeUcUTY`edQc_RBU%LETUS1% aeUQ`QtUSU^WWeQj_U^duReU^'AYU^ddQ:aeU\QSeUcdW^QdU^UbU^SeU^dQ%LcTUSYWeQj`Utc ^QcUQYYYWUU^dUS ^tbu`U5d Qcec`b`YQc QSSY_^Uc4cY^_\ XQSU%U^_SYUbaQS_^cYTUbQSW^e_ab_% BUNUbbe^QSd_S_^bUc^USd_QUcd_c_RZUd_c_Q?dUc_TU_aeU_ab_'@Q]_U^dU_U^ce TUBUBJ YQSW^i VQUUSSW^9U^Ucd c SQc c% Uc] sc Yi UTQQQi TYBUSQD U^dU Q\S BBU^dU QSUBSQTU\ c RZbd c`BUCU^dQT c4`Ub\ c QSd c YMAQULC% e^QQSSYM^`eUTU^cubQTUSeQTQ] U^dUUUWYT Q^dUcTUaeU do': ^SQTQ`Qc TU,`b WYUc TU\Q] U^dU%QTUdUj Y^QSYM^^ cUdQdQ $TU \setminus_{\mathbf{C}} = \mathbf{R} \mathbf{L} \mathbf{U} \cdot \mathbf{Q} = \mathbf{L} \mathbf{Q} \cdot \mathbf{U} \cdot \mathbf{Q} \cdot \mathbf{Q} \cdot \mathbf{U} \cdot \mathbf{Q} \cdot \mathbf{Q}$ _c_RXXd_c%\`_bbq__^uc^_d]QbQd_T_c_cTU_c_RXXd_c'B__XQi_^uSUc\fqTTUce`_^ub%eU\Q]U^du^e^\$Qu^d_TQU\UWbQTU5eQTQ]U^du e^ TU\ c RZUd c Q^dUc TU aeU db 3i Q cUQ Q^dUc TU XQRUbQT `dQT % TUc`et c' 9 U XUSX %U, X] RtU `dQ` bd] Qb d SQbe^ U^\eWQbTU _do_4`Ub_ ^_ `_baeUcUUWWW_d_] Q%_d_SQT_%Ub_Q`QbdbTUS_^c\fTUbQSY_^UcUhdbQ^72Ub_c':\SQc_UcQcu%aeUTUT_cS_cQcaeU_WLUSU%c^ X_1 RBU `eUTU%_bS\Ubdic kg_^\ucksig_\ucksig_1 CbQaeU_ aeU \undersignig Q_bQ\undersignig U\uddic \undersignig Q_bQ\undersignig U\uddic \undersignig \undersign $TU/QS_cQd_JQTQ% VQUUSSW^TUd_JQt%_^TTYUtcQc3`_bV_aeUUct^*V^0^e^SQc_U^UV_AeU^UC_S_cQc_aeUcU`tucU^qQ^c_^WeQUcU^VQc_S_cQc_aeUcU`tucU^qQ^c_^WeQUcU^VQc_S_cQc_aeUcU`tucU^qQ^c_^WeQUcU^VQc_S_cQc_aeUcU`tucU^qQ^c_^WeQUcU^VQc_S_cQc_aeUcU`tucU^qQ^c_^NeQUcU^VQc_S_cQc_aeUcU^UbucQc_3`_bV_aeUUcQc_3`_bV_aeUUcQc_3^WeQUcU^VQc_S_cQc_aeUcU^UbucQc_3^WeQUcU^VQc_S_cQc_aeUcU^UbucQc_3^WeQUcU^VQc_S_cQc_aeUcU^UbucQc_3^WeQUcU^VQc_S_cQc_aeUcU^WbucQc_3^WeQUcU^VQc_S_cQc_aeUcU^WbucQc_3^WeQUcU^VQc_S_cQc_aeUcU^WbucQc_3^WeQUcU^VQc_S_cQc_aeUcU^WbucQc_3^WeQUcU^VQc_S_cQc_aeUcU^WbucQc_3^WeQUcU^VQc_S_cQc_aeUcU^WbucQc_3^WeQUcU^VQc_S_cQc_aeUcU^WbucQc_3^WeQUcU^VQc_S_cQc_aeUcU^WbucQc_3^WeQUcU^VQc_S_cQc_aeUcU^WbucQc_3^WeQUcU^VQc_S_cQc_aeUcU^WbucQc_3^WeQUcU^VQc_S_cQc_aeUcU^WbucQc_3^WeQUcU^VQc_S_cQc_aeUcU^WbucQc_3^WeQUcU^VQc_S_cQc_aeUcU^WbucQc_3^WeQUcU^VQc_S_cQc_aeUcU^WbucQc_3^WeQUcU^VQc_S_cQc_aeUcU^WbucQc_3^WeQUcU^VQc_S_cQc_aeUcU^WbucQc_3^WeQUcU^VQc_S_cQc_aeUcU^WbucQc_3^WeQUcU^WbucQc_3^WeQUcU^WbucQc_3^WeQUcU^WbucQc_3^WeQUcU^WbucQc_3^WeQUcU^WbucQc_3^WeQucU^WbucQc_3^WeQUcU^WbucQc_3^WeQucU^WbucQc_3^WbucQc_3^WbucQc_3^WbucQc_3^WbucQc_3^WbucQc_3^WbucQc_3^WbucQc_3^Wbuc$ $TU_d\underline{0}'M`_b \setminus d\underline{0}'\underline{d} \setminus c QbMe] U'\underline{d} c aeU ceUU^bUS_WUMS_^U U'NTU UcdQbQce`\underline{b}`wc'\underline{1}'MURU^cUbTU`\underline{b} RQbaeU Q] U'dU U\WW \QQSSW^U^$ `UbUSdQYTNUUUYSQX&_^bUc`USd_Q\QQSSWY4i_^_`QbQ`b_RQbaeU\Q]UYdU\\WU\QQSSWYU^`UbUSdQYTNUUUYSQS_^bUc`USd_Q_RZUd_4_SeQ, Uc] ei ` c'R\U% c'/`U] RQbW %Qf \e^aQTTU ^ QSabQbU^QRc \ed c'/`Q\SYDAU`\bUfQU^dU%`\bU`\TUbQb' ^QTUSeQTQ i _`aQb` bU,QRQ*T ^ _aeU.ce]U^dU`bUMCbU:^dQ,SQt_%QU\USSYw^TU\QS_cQd]QTQ%\QU\USSYw^TUd]Q%c_^TYfUbcQt3`_b_aeU.Ucds^U^e^SQt_U^U\aeU YQCS_CQCaeUcU`BUCU^QQ^c_^YMAQUCU^VQUCdf|QTU/Q]U^dU%\ ^YWA^_TUU_C`BUXUBU H_T_UCUXUBX_i \QUN`UBU^SQXQBUUFYTU^dU%UC `UBUSQQYTMUULYSQS ^BUc`USd Q, RZUd4\ SeQ,Uc]ei` cYR,UY% cY^U]RQBW%Qf \e^dQTTU^ QSdeQbU^QRc \ed cY^Q,YSU^dU`BUFQ,U^dU% `bu'_~Tubqb_^qTu5eqTqi_`dp_bu\qRQ*T_^_aeUce]U^du`buxbbu:^dq,5Qc_%QUU55%^TU\QS_cQd_]QTQ%\QUU55%^TUd_]qb%_^ TYUtacQc3` b\ aeUUcds^U^e^SQc U^U\aeU\QcS cQc aeUcU`bUcU^dQ^c ^\WeQ\Uc U^\QUcdf QTU\Q] U^dU% ^YWe^ TUU\\ c`bWXUbU H T UcUXUSX i \QUh`Ub

+ Cold bg w Tus_Nectwi TWSe/dot un ucdu ccend % cusulcus%_ Txdrwerbunduency thrubunso wurubo, ency thrubunso so huch usd old aeu xosubunench txd sc txdondu wurubo, tulo i con the control of txd is the control of txd in txd in txd in txd of the control of txd in txd in

@\\RUMDTTTU\Qf_\e^dDTC ?_^QX\Q^^: Tg\Q\$TC

GUSSYi^J ≯

$: ^SeQ^d\underline{\ QQQ_SY_0^TVUQNRUbdDTTUQf_e^dDT\%eUS_^cdQU^QY^TWUbU^SYQ$

 $aeUcWYWSQbuQ%aeUc_i cU^cYRUx%Qi QWe^c%aeU%aeQ^T_cUXQRQTUQVRUbbTTUVQf_\e^dbTS_] = aeUS_^cYdUU^\QY^TWUbU^SQ%UU AQYTWUBU^SQWbU$ $\label{eq:constraint} \textbf{Wh.} \textbf{ LUCQYS}_]_\textbf{cYY}_\textbf{ CULUQYUYMICUYMIT}_\textbf{TU}\\ \textbf{QYTMCUYSQTU}\\ \textbf{QYS}\textbf{YYQS}\textbf{WY}_\textbf{QUTUYSQTU}\\ \textbf{QY}_\textbf{QYTMCUYSQTU}, \textbf{TULUYSQTU}\\ \textbf{QYTMCUYSQTU}, \textbf{QYTMCUYS$ $TU,Q; Q; TU,Qf_e \land Q; TV_e \land TV_e$ $\verb| YTMULU^SQW, QCUQQ (QTULUSXQ_Q)(Q)| ae'UbTQ\% RYU^QSdeQb_QRCdU^UbcUTU QSdeQt\% ^_S]_Q, do_'9 U XUSX_\% Lcd_'QUSU cUbe^ \texttt{kUNYO} \texttt{VY'd} \texttt{TU} \texttt{QWe} \land \texttt{c} \texttt{UCSM} \texttt{kUc} \land \texttt{QmMSe} \texttt{QKUc} \land \texttt{C} \texttt{O} \texttt{U'MW} \texttt{kUSY} \land \texttt{YY} \texttt{U'MOTQc} \texttt{weUTU} \land \texttt{YWe} \land \texttt{Q} \texttt{Q} \texttt{QYUQ} \land \texttt{QYUQ} \land \texttt{QTU} \texttt{Uh} \texttt{kUcW} \land \texttt{QUC} \texttt{QUC$ S_^SU^ce c/W/WSQT_%SeQ^T_XQSU^e^QTrcdr'SW^U^dble^QYTMUbU^SQTU,Q] QU^SeQ^d_Qce`_TUb_\QSQ`QSTQTTU.UUWB% \Q YTNULLU^SQTU,Q]QS_]_QVQ`LUNULU^SQQ_U\USSW^U^cu]Yc]Q4icY^_cUU^WQvQ^Qcu]Yc]_cQ\YiQM^QbaeU^_dU^U^^YWk^cYW^YWSQT_ $\label{thm:linear_continuity} \textbf{Ttd}' \underline{\textbf{U}} \land \underline{\textbf{Q}} \underline{\textbf{V}} \land \underline{\textbf{V}} \\ \textbf{TU} \land \underline{\textbf{V}} \land$ `_TUb__VQSe\vIDT_TU\Qf_\e^^dDT%_VQY^TNVUU^SQTTU, UcdQT_ aeUU\Qj_Qj_Y;]_Q%aeUdU^U aeU`_TUb__VQSe\vIDT%aeUXQcdQQX_bQcU]_Q^dU^UU^ SeQY_I_Q, UZUGSY_TUU:U`_TUU%U^\QU\USSW^cUbs `_bi `_bi `_bi QGQ 9U:U_TYSXQ: UMYUbQc cU S_^c\TUU:U Q_YT_% QcUQaeU S\QQi() U^U S_^ SU^ce c/WYMSQT_%EQ^T_XQSU^e^QTCdrSW^U^dtU e^QY^TMUtU^SQTU,Q] QU^SeQ^d Qce`_TUb_\QSQ`QSTQTTUUUWM%\Q `_TUL__YQSeYdQT TU \Qf_\e^dQT%_\QY*TNYULY^SQTU\ UcdQT_ aeU U\Q] Q] Y;] Q%aeU dYV1u aeU`_TUL__YQSeYdQT%aeU XQcdQQX_LQcU] Q^dYV1U U^SeQ^d_ Q\UXULSYSY_TU Ucl

 $\label{thm:converse} $$ MQaeuXUTUcUvQQtMu^`bij Ub/eWQtMaeU`QtQXQSUbQSQR_UcdUUcaeUj QTU/Q@RUbdQT%QYTYUUU'SQTURUcUb`UbUSdQi QRc_\edQ4 $$ dU'U aeU XQRUbe^Q\\RUbdT`\UbUSdQTUd_T_`bu'_^TUbQ\'^Q'dUSUTU^dU_YS\\YQS\\^CUTURUQaeU^_Ucds^U^dUbQj U^dUU^cuBc\YSeQ^T_$$ TU aeU UZUSU ce `b_`Y_`_TUbc_RUbQ^_ c_Rbucu] \text{$'} _\M_d^d_SUc ce \text{$'S\\YQS\\'^cUTURUQaeU^_ Ucds^U^dUbQj U^dUU^cuBc\YSeQ^T_ cU`b_`_^U\T_c_`eUcd_c Q\Q$$ $$ Q\Q$$ $$ TU aeU UZUSU co \text{$'} _\U\du\cap C_\Cap C_\Ca$

Q] Q` bce UUSSW^%Q`b`eUcdQ^ U^S ^ddQbU,Q] QU^ce d dQ\TQT U\e^UcdQT TU\e^YUdU\SQV\d \SUc ^ cUU\SeU\ddQU\e^\UcdQT TU \\RUbbQT`QtQ\Q]UbQQed_89: H: FA \\$68 \RU\]U^_b\\\BQT_TU e^c\cUcW_Q?dUSUTU^dUTURU cUbS_]`QdR\\US_^ce ^_S\w^TU\\RUbbQT`D_bbQ?d_ dtij `_ \$_] _ Y\$\YQ\$W^`bUF\Q`_cUU\Qf_le^dti% ^_cUU\\j YQ%U\Q^dtbYbcUe^UQ\Qx\dif Q%TU] _T_ aeUUc \$_] `\utd\] U^dU\j `_cYR\UaeU\Q $\label{eq:liked_final_$ `bur_] ^Q^du%_S_^dqbY_Q_aeUcU^S\^QQ@_aeU\Qf_\e^dqr`bu\dbu%Uuc_%&TQc\QcS_cqcS_^c\fubqrqc% bu_^Tubq\bQ|`Qc': c \M&Q]\U^dU\\]`_c\R\U\aeU\Qf_\e^dQT`\Q&QUcS_\WUbU^S_^dBQTU\ce`\b_`\Q\Y\$\Y\Q\$\W^`\BU`_^TUBQ^dU\BUcd\dU\\U\`\BucU^dU\\QaeU\Uc\Q`\Bu\Ubb\ $\label{eq:control_control} $$ \parbox{0.5}$ $$ \parbox{$ Qed_TUUUB) YQSWY @ aeUUc e^QSd_\RBU Qed_GTUUB) YQT_%TURU cube^_ aeUTUUB) YQ\Qf_\e^AQT_U^\Q`_cuc\w^i ec_TUe^Quc`US\U `USe\YQbTU\YRUbdQT4dQ\S_]_S_^cdQU^e^Q\YRUbdQTTUd_TQS_cQ%eU%YY&UbQQ\\%XQbQY|}`_cYR\UaeU\Qf_\e^dQT%U^LUU]_]U^d_%TURUcUbTU _d_]_T_aeUTUUcQ]Q^UbQQ\QaeUcUdU^TU_U\UMbU^S_^dbQTUce`b_`\Q\U\SS\M^`\b\cU^dU @0f_\e^dQT%_b_dQ^d_\%YU]`b\Ui SeQ^T_cU $\label{eq:local_$ $TUQed_TUMUi) YQSW^* @ aeUUc e^QSd_VMUQed_GTUMUi) YQT_%TURU cube^_ aeUTUMUi) YQVQf_[e^dQTUV^[Q] -cuc\w^i ec_TUe^QUc`uSVU = 0.$ `USe\XQ5TU\XPUbbQT4dQ\S_]_S_^cdQU^e^Q\\RUbbQTTUd_TQS_cQ%eU%YA9UbQQ\\%XQbQY|}`_c\R\UaeU\Qf_\e^dQT%U^UcU]_]U^d_%TURUcUbTU _do_]_T_ aeUTUUcQ] Q^UbQQ/QaeUcUdU^TU_UUMbU^S_^dbQTUce`b_`YQU/USSM^`bUcU^dU@0f_/e^dDT%_b_dQ^d_%cYJ|`bUi SeQ^T_cUUcdkRQZ/QYYVeU^SQ

 $\label{thm:constraint} GYSeQaeYUbQTURUbQTTURUbQYTYMUBU^SQTURUcUb`UbYUSd_4`Ub_Q`UcQbTUe^Uh YSYYQSW^cWeUbCYU^T_%cYU] RQbW_%cY^_Uc] ei VeUbdU%_cYRUJ U^dU%QVeUbjQTU\Qf_\e^qQT`eUTUce`UbQb_`_^U^i aeUB&: cdUUc Wb_cUbQJ U^dUQRcebT_4`_b\QVeUbjQTU\Qf_\e^qQT%aeUcUQdQ^WbQ^TUaeU^e^SQ%UTQdQ,c_RUbQ^QQiT_] YY_%_]_ `QbQSQecQb cu`bUbUbbi ^_`buVUbbWQJ_Y_ \gamma_1 \gamma_1 \gamma_2 \quad \qua$

BUSUCY_TUSIS^QTQ] sc aeUTU]_cddQ%aeUcy>TWUUYSQcUbUcU^SQ, \QqQ\Q\RUIdQT\UUCQ\RUIdQT\\aeUcub\UT\QeUcub\UT\UCd\U\SQ\QT\UUCd\U\SQ\Q\\Cec]_f\}\U\de\U\d] UTYQU\

aeU\Qf_\e^dQT\Ucds\TUC\b_f\d_TUUcd_%QcdQQX_bQUc aeU\Q] \YUDQTUUcQ\\RUIdQT\\aeUcub\UT\Qucd\UCds\U^SQ\QS\TQT\TUcUbce\b_\b_\Y\

TUUUJ\YQ^dU%\^cUbU\Qec_\ed_\Q\\Cec]_f\}\U\d_c i TUUUJ\YQ\U\d\Cec]_f\] UYY\eU\SQTUQ\We\Q_dQS_cQ\U\cec]_f\]\\U\d_c i TUUUJ\YQ\U\d\Cec]

 $= QRYU^*T__RcUtfQT_UcdQcS_cQc%tQdU]_cCQX_tQCYUcdQ^_SW^*TU^QVRUtdQTTU^Qf_\e^dQTaeUS_^cYcdUU^QY^*TYUUU^SQiU\UaeYWRDY_% QQed_TUdUt]_YQSW^*TU^Qf_\e^dQTU^dQ_UcdQT_%__cQRcebT_UYS_^cYcU^dU$

6X_bQ/Q`buwe^qQUc%xYQWe^qfUj U,Q] QTU,X_] Rbb`_~UQTUQ7dUe^Qsd_TUf_\e^qdT%} Yb^dbqc aeUd_TQfuQcU] Q^db/UU^e^Ucdot_TU \\RUbadJT%QcQRUBU^U_U_CU^aff_TUe^UcadJT_TUY^TWUBU^SQ4_cYU_Q]QSQTQfUjUZD6Ue^QSd_TU`BUUBU^SQ%\\YU^abQcaeUU^UcU]Yc]_ $\label{eq:local_control_control} \label{eq:local_control_control} \label{eq:local_control} \label{eq:local_control_control} \label{eq:local_control_control} \label{eq:local_control_c$]_cddQb_QRcebT_TU\QbUc`eUcdQQXbjQXfgQb_bb_bbTu5e\QcUbuQ`QbQSeQaeYUbwbXQ^_TU\YcYcdb%aeUU\Q]QU\YWUe^QS_cQQ^dUc aeU_ddQ% _db2%\\^U, | `t.] _] _] U^d_U^aeU^_db\^U`B\\\bu\\S\\^i`B\\\\b\S\\^i`B\\\\b\S\\^_] sc`eUTUUcd\bU^e^Ucd\t_TUYT\\\\b\\S\\%eU\, $]_fY]_YU^d_`eUTUUcdQbU^e^UcdQT_TUTUcSQ^c_\%_aeUU,`bU_^TUbQXL^TU\QUcSQQTUe^QRQQY`g`eUTUUcdQbU^e^UcdQT_TUUae\\\Rb\L':\$]_f\]\Yu^d_`eUTUcUbU\c\Y\e\Yu^dU]_] U^d_TUc`et.cTUe^TUc\$Q^c_4`Ub_^_`eUTUS_Un'cdbS_^U\Q%J^d_T_%/\$\ec__c] U^_c% QddUTUU\\Q $6cu_`SW^\land eUTU.cUbY^\end{bmatrix}.UTQdQ].U7dUTUc^et.c.TUe^UcdQT_TUYTWUUJ^SQ%.Ub_^_`eUTU.S_Uh2dBS_^UJQ8YS]ec_U,`bf/SYY_TU.aeU^_cU.$ $U^*SeU^*dQU^*e^*U^*dQT^*MU^*SeQaeYUbWQT^*QCUJ] \cdot MU^*e^* \\$ $\label{thm:continuity} $$ U^{1}_{N} = U^{2}_{N} U^{2}$ $S_{0} = C_{0} + C_{$ $\propto \propto \pro$ $XeR'UbQTUZQT_TU cUbfUYdUQv_c QYdUcTU aeUS_] UY'QDQQQSSWY': ^U,]_] UY'd_UY aeUTUZQTU cUb/YRUbdQTYFUZQTU cUbe^dubl_TUSeQaeYUb$ S_cQ GYQ\eji\Q_cSeb#TQT cU ceSUTU^TU_tl}QY'cdQYds^U2XQ\ej SQ\WXq\ej SQ\WXQ\ej SQ\WXdL]UL`et c TU aeU XQcQ\f_%QtQ XQSUbSeQaeYUbS_cQ\\WXdt_]U _ RBMQ^dU%U^U,`bi]_Ub]_] U^d_TUS_] `\UdQ_cSebiTQT%^_] scaeU] UcUc_ Qv_cTUc`etc'@QfYTQcUTU^_] Y^Q^QTQTUfYdQxY[`_bdQ^SSQ%U^U, GYQ\eji\Q_cSebTQTcUceSUTU^TUVb]QYcdQ^ds^UQ%Q\ejSQ\WBQ^QTQTUC`etcTUaeUXQcQ\T%QbQXQSUbSeQaeYUbS_cQ\\WXds]U_ $RbM(Q^{\prime}dJ^{\prime}U^{\prime}U^{\prime}, b) \ [\ Ub] \ [\] \ V^{\prime}d \ TUS \ [\] \ VdQ \ cSebTQTV^{\prime} \ [\] \ sc \ aeU \] \ UcUt \ [\ Q_{\prime} \ c \ TUc^{\prime} \ et \ c' \ @QfTQTUf^{\prime}dJ^{\prime}, b) \ [\] \ VQ \ ^{\prime}QTQTUf^{\prime}dJ^{\prime}, b) \ [\] \ (\) \ bdQ^{\prime}SQV^{\prime}J^{\prime}, b) \ (\) \ (\) \ deg \ (\) \$ GYQ\eji\Q_cSebfQTcUceSUTU^TUV_bjQYcdQ^ds^UQ%Q\ejSQ\WBQ^QTQTUC`etcTUaeUXQcQ\fT_%QbQXQSUbSeQaeYUbS_cQ\\WXdc_1U_

@\\rutagrTU\Qf_\e^dgr ?_^QtKQ^^: Tg QtTc

@ aeUcUQXt[QtcaeU\Qf_ke^dQT%]YU^dxQcaeUd_TQfuQcU]Q^dbU^UU^UaeY\RbY_`UbXU5d_%Y^`bUXUbU^SXQ%TUdUb]Y^QaeUU,`b_`Y_SQ[RY_TU $\label{local_problem} \begin{tabular} \protect\columnwidth\colum$ `bu`_~Tubqay_~4U^d_~Suc] U WecaqbaQ`buwe^aqb%eYu\q] Q^_ Tublbi YQ\QTU U\USSW^4_ cYQf_\e^aqT TU\\UwqbQe^QTublbi YQSW^`QbQ $\label{thm:condition} \mbox{ und ``suc `_Tudud; YQTU] Q ``ubqf_\e^ddbQ M cYu,Q] Q `_Tudud; YQTU] Q ``ubqf_\e^ddbQ' ``_bce ``b` `YQf_\e^ddTM o U^aet cU^dT_dU'Uce $$ \mbox{ of L^2 and L^2 and L^2 are L^2 ar$ $\begin{tabular}{ll} TVQbs aeU5 McYQf_ke^QT $$ _ \LVDbY $$ $$ AeU5 McYQf_ke^QT TU QF_ke^QT TU QF_ke^QT UZU5YQV $$ OE et $$ QCUTU $$ $$ AeU5 McYQF_ke^QT UZU5YQV $$ OE et $$ QCUTU $$ AeU5 McYQF_ke^QT $$ AeU$ $\label{eq:locality} $$ \C LUBLISTQ ^bU, Q_1 QU^LCQ: TUULQ_1 YQSY^LCSU^A LABEL ^XQ LUBLISTSY_TU Y_2 SW^SaeU ^c c_^f_e^dQbY_c% U^L aeU YQf_e^dQT ^c_$$$ cultumoutus Dub. cycu/u`utij mouto@aeu ucotTutulij YQSW^uc e^QSd. Tu U,USSW/% cu Ycxtdu u^aeu u, Qj. Q%j Yu/otiQc aeu d TQFuQcu j Q/otiV~u _cseb#QTTUUh`bucYw%Qe] U^qQ\QY^S_^cYdU^SQQ 9USY%U\QSd_\RBUTU\Qf_\e^qQT%_U\QSd_aeU\Qf_\e^qQTUZUBSUU^e^UcqQT_TU\RUbdQTi\Q $\label{localization} $$U_{Q} = U_{Q} = U_{Q} - U_{Q}$ _Se/liQbe^`_S_TU_QRcebT_%U^\Q_cSebYTQTTUUh`bUcYw^%Qe]U^dQ\QY^S_^cYcU^SQQ9USY%U\Q8d_\RBUYTU\Qf_\e^dQT%U\Q8d_aeU\Qf_\e^dQT `buvbb^sxqxbcdq^d_s_1__tusbaeuu,q1 quxw#qbqaeubbi `qbquuwbc_^\q1 \s_cq\$%^ruussw^% `buxbbc^`buvbb^sxq%s_^u,\r` $TUSQecQb_`b_TeSbU,S_] \ "U"]_TUe^Q` \ "bJUbU^SQ\"_V" \ "bJUbQ_`SW' MUtd_Ut\%eU \Q` "bJUbQ_`SW' CUUZUBU c'Y`UUSSW'\%_^U, \W^TU \ "bJUbQ_`SW' MUtd_Ut\" bJUbQ_`SW' CUUZUBU c'Y`UUSSW'\%_^U, \W^TU \ "bJUbQ_`SW' MUtd_Ut\" bJUbQ_`SW' CUUZUBU c'Y`UUSSW'\%__Y \W^TU \ "bJUbQ_`SW' MUtd_Ut\" bJUbQ_`SW' MUtd_Ut\" bJUbQ_`SW' CUUZUBU c'Y`UUSSW'\%__Y \W^TU \ "bJUbQ_`SW' MUtd_Ut\" bJUbQ_`SW' MUtd_Ut\" bJUbQ_`SW' CUUZUBU c'Y`UUSSW'\%__Y \W^TU \ "bJUbQ_`SW' MUtd_Ut\" bJUbQ_`SW' MUtd_Ut\" bJUbQ_`SW' CUUZUBU c'Y`UUSSW'\%__Y \W^TU \ "bJUbQ_`SW' MUtd_Ut\" bJUbQ_`SW' MUtd$ `b_TeS1b`_bcu] Y:] _ Qe^aeU`eUTU_SeVdQbe^`_S_TU_QRcebT_%U^\Q_cSebTQTTUUh`bUc\w^%Qe] U^dQ\QY`S_^cYcdU^S1Q`9USY8%UQSd_\RbU $TU /Qf _/e \land DT \% \ U /QSd _ aeU /Qf _/e \land DT UZUSU U \land e \land USUSU U \land$ f_k^qTS_^U,W^TUSQecQb_`b_TeSbe^Q`kUUUU^SQXkL qQ^d_S_]_TUSbaeUU,Q]QU,WW#QxQaeUUUbi`QQUUUWbc_^\Q]X;]QS_cQ\$%Y^U,USSW/%`kUWUUUY^`

: ^ce SQc_% QtQ Uf QT/bUcdQc S_cQc%fURU`_cUUt%aeU e^UcdQT_ TU\/RUtaQT i e^UcdQT_ TU\/YTMUUt/SQ^ c_^\c] \cdot\c] \cdot\c deu U\
`bif Ub_`eUTUcUbcY^aeUUcdUx\dif_4cY_aeUTURUTUS\b%aeU\QYTMUUt/SQ c\MeUc\bYT_UcU^SQ\`QtQ\Q\\RUtaQT% QaeUUc ^USUcQbY_\b
Y] UTQQQ] U^dUQ^duc TUU\\Q4cYU^T_UcU^SQ\`QtQ\Q\\RUtaQT

@\%Ubd\T\U\Qf_\e^d\T\ ?_^QX\Q^÷: Tg\Q\$Tc

RTE ~&MO ~AMPONLE STRINZON, ONLOCALLANSENI, RED POSERILIEN. BCRR. CENT. CAMERALAR E 2 CC3

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#': cdQTUdUbj YQ\$W^TU.cec`U^TUb\QQ\$deQ\$W^^_ cwl_ Uc e^Q\$d_TU\Qf_\e^dQ\$T% Ub_ cU.ce`_^U aeU.Uc U, x^\$6_Q\$d_\RbUTU\Qf_\e^dQ\$4 `_baeU cUTYSU%aeU Ucd_Uc _ aeU\Q\RUbatTTU\Qf_\e^fqtTS_^cxdd'&GYUc Qct%U^d_^SUc d_T_ Ucd_Uc U, Q\$d_TU\Qf_\e^fqtTaeU dU^U]_c aeU $\label{eq:continuity} \text{dU}^\text{L} \text{U}^\text{L} \text{U}^\text{L}$ _c Q&d_c aeU Ucds \\RbUs McYUcdu Q&d_TUTUdUb) \YQbe^Q cec` U^c\w^cUQU, x^16_ Q&d_U^U, aeU\Qf_\e^1dDT Uc \\RbUs\Q\$_1d^eQ\$w^\@eU \$_1c\du TU cec`U^TUl%/^S\ec_ UcdUQ5d_%/QcdQaeUXQ;QXQRYI___`_bbe^YITQT`QbQaeU\QTU\RUbQ5Vv^SeYIQT_cQ;Dub_ Ucd_ cubs `QbQce] Ub/VbcU TMUSdQ] U^dUU^U\cU^dT_] sc Wg_cUbQ%_baeUUc U, QSd_TU\Q`b_`YQ.cec`U^cYw^aeUUcdQ]_c XQR\Q^T_TU4i ^_XQ; Uc`QSY_`QQe^Uc`QSY_TU TU/RUIQSW^i TU cec` U^c\w^S_^U, \w^TUTUdubl, \www. \cec` U^TUb_ ^' DQtQ aeU ce` _^U/aeU \Q cec` U^c\w^\YSec_ U^cu] \cdot \cec` \cdot \cdo\ U^bUQ\ffQTTUcec`U^c\w'^MQaeUTebQ^dUu,Uc`QSY_TU\Qcec`U^c\w'^%Q,S_^c\fTUbQb\Qcec`U^c\w'%M,QSd_Uc%`c_\V\$d_%ec`U^fff_'B_XQ\] UTY_U7dU\Qcec`U7cYk^TUQSdeQt% TUY?] UTQd_U^\e^SY_^Uc4i `_b_ dQ*d_^ XQi `_c\RY\TQT TUUY\Qbi QcUQU\e^_ _ U_db_] _] U'\d'\ `_baeUUcU\QSd_TU\Q`b_`YQcec`U^cYM^aeUUcdQ|_c XQR\Q^T_TU4i ^_XQ|Uc`QSY_`QbQe^Uc`QSY_TUTU\RUbQSYM^ii TU\cec`U^cYM^S_^U,Y^ $TUTUdUdj YQbcYfQj _c Qcec` U^TUb_ ^' DQtQaeU ce` _^U/aeU Qcec` U^cYw^YSec_ U^cu] Yc] _` eUTU cUbTYKUbTQ8SeQ, Uc QRcebT_4` QtQU, Uc QRcebT_4 QtQU, Uc QRcebT_5 QtQU, Uc QRcebT_6 QtQU, Uc QRceb$ $TetQYdUU,Uc^{\prime}QSY_TU^{\prime}Qcec^{\prime}U^{\prime}CYM^{\prime}UQ_Sec^{\prime}U^{\prime}CYM^{\prime}UQ_Sec^{\prime}U^{\prime}CYM^{\prime}U_Sec^{\prime}U^{\prime}U_Sec^{\prime}U_Sec^{\prime}U^{\prime}U_Sec^{\prime}U^{\prime}U_Sec^{\prime}U^{\prime}U_Sec^{\prime}U^{\prime}U_Sec^{\prime}U^{\prime}U_Sec^{\prime}U_Sec^{\prime}U^{\prime}U_Sec^{\prime}U_Sec^{\prime}U^{\prime}U_Sec^{\prime}U$ @\\rundom \tu\\Qrf_\e^^d\m\ ?__^QX\Q^^: Tg\QbTc

M%QTU] sc%kkd_fQQS_] `QvQT_TUQRcebT_bTuSe_TU_dQ] Q^UbS`_bQX_bXXQ\QUUNUBQTTUfeU\QU\\\YYYYd_4i aeUUc `QQQ

M%QTU] sc%kkd_fQQS_] `QvQT_TUQRcebT_bTuSe_TU_dQ] Q^UbS`_bQX_bXXQ\QUUNUBQTT_'QBX\QU\\\YYYYd_4i aeUUc `QQQ

MCYQ\RUbaQTS_^XC\UUNUBQTS_^XC\UUNUBQTTUQCec\U\\YYYYd_4i aeUUc `QQQ

MCYQ\RUbaQTS_^XC\UUNUBQTS_^XC\UUNUBQTTUQCec\U\\YYYYd_1' @\SeQ\\YYYYYd_1' @\SeQ\\YYYYd_1' @\SeQ\\YYYYd_1' @\SeQ\\YYYYd_1' @\SeQ\\YYYYd_4i aeUUc `QQQ

TYMSE\\QTUC i YfUcd\WQS\\TUQCec\U\\YYYYd_1' @\SeQ\\YYYYd_1' @\SeQ\\YYYYd_1' @\SeQ\\YYYYd_1' @\SeQ\\YYYYd_1' @\SeQ\\YYYYd_1' aeUUc\\YYYYd_4i aeUUc `QQQ

\$_TESX\\Y\UNUQT\\] e^T_'

XNEX_2_CLGRNDCCMR N'CRG Incec, n.c.kw_In/Olingrij Lazkw, in/Olingrij Lazkw, in/Olingrij Lazkw, in/Olingrij Lazkw, in/Olingrij Lokw, in/Oli

: ^WUNDQ%UUCG UNSUTUYT_] Q^MXCd_%eU\Q\RUMDTTU\Q] U\d\ _ S_^XdU\QYTMUUYSY\ Qed_&S_^ddU\SYKUUCG UNSUTUYT_] Q^MXCd_%eU\Q\RUMDTTU\Q] U\d\ _ S_^X\d\ QYTMUUYSY\ Qed_&S_^ddU\SYKUUCG UNSUTUYT_] Q^MXCd_%eU\Q\RUMDTTU\Q] U\d\ _ S_^X\d\ QYTMUUYSY\

GUSSYu^J >>>

GUYCYCUU`BYSY`Q] U^UUU^`_bQG|Y^Q^_C%U^UCQUS|AbqfUucYQ%S_]__] sc\j\`_bucYw\TUS_^dYWU^SQS_]__`eUcd_%_cw_Q\Q f_\BY_^UCY_UC%__c Q&d_c TU\Qf_\e^dQT%_^QS_^UUSj\`YU^d_c S_^dYWU^UC4\QS_]`\bucYw\TUS_^dYWU^SQS_]__`eUcd_%_ cw_Q\Q V&UG_QUY__Qd_TQ^USUCYTQT' D_bUc_] UYAUUCQUS_^db_fUucYQ%S_]__\] sc\j\`_bucYw\TUS_^dYWU^SQS_U\\Q\\P\Q\\P\Q\\P\

@\%UbdTTU\Qf_\e^dT ?_^QX(Q^: Tg Q5Tc

 $\label{thm:conversed} $$dQ_RY_CY^USUCYTQTTU_QS_CUSeU^SYQ_e^QS_UNW^YUQYR_US_SeQaeYUbS_cQV_BUW_YW&: ^cUWe^T__\eWQB%Y%YQcu\\eUbQ%USQ&CUBQU^QRc_\ed Q_eTQbQ\QSQecQTU_Q\\RUbdQT'$$$$

 $$$A UWecdQbQS_^cTUUQbcYQf_e^dQTUce^QS_cQaeUQWe^QfU_LXQSUS_^e eUTU_WWQbQ^QcQSTUUcdQ] Q^UbQSTUV_BLQS_^dYWU^dU_LXQSUS_^e eUTU_WQbQ^QCQSTUUcdQ] Q^UbQSTUV_BLQS_^dYWU^dU_LXQSUS_^e eUTU_WWQbQ^QCQSTUUcdQ] Q^UbQSTUV_BLQS_^dYWU^dU_LXQSUS_^e eUTU_WWQbQ^QCQSTUUcdQ] Q^UbQSTUV_BLQS_^dYWU^dU_LXQSUS_^e eUTU_WWQbQ^QCQSTUUcdQ] Q^UbQSTUV_BLQS_^dYWU^dU_LXQSUS_^e eUTU_WWQbQ^QCQSTUUCdQ] Q^UbQSTUV_BLQS_^dYWU^dU_LXQSUS_^e eUTU_WWQbQ^QCQSTUUCdQ] Q^UbQSTUV_BLQS_^dYWU^dU_LXQSUS_^e eUTU_WWQbQ^QCQSTUUCdQ] Q^UbQSTUV_BLQS_^dYWU^dU_LXQSUS_^e eVTUV_WQS_^e eVTUV_WQS_^eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^e eVTUV_WQS_^eV$

 $\label{eq:model} $$ MQaeuXQi aeU dU^Ub` bUcU^Ub'aeU XQTU] _cdbQi_i Q'aeU ^QTQ` eUTU ceSUTUbcY^ e^Q SQecQ'_e e^Q bQ w^%_b _aeU UhYcdu TU UcdQ] Q^UbQi ^_TU _dbQii \QUI'YTU^SQTU Ucd_cU XQQ` \SQT_ c_Rbu d_T_ Q_c Q5d_c TU \Qf_\e^dQT ^6X_bQRYU^% cYUcd_Uc Qcu'xcu` eUTUTU] _cdbQbaeU cU cYWeU'aeU_c Q5d_c TU \Qf_\e^dQT ^_ c_^S_^YWU^duc'_e cY^ USUCYTQT%U^U\ cU^3t__TU aeU XQR\Q4\Q] UTYTQU^aeU QaeU\\Qc S_cQc aeU dU^U^e^Q SQecQ_e^Q bQ bQ w^TU ce UhYcdu^SQYTURU S ^USQbcUS ^ce SQecQ : cd `QbuSU` b\Qc cWeYU^duc S ^cYTUbQ$Y^Uc'$$

CMPLOS THUM, I IN OLIDARAN, IN CHIRAL TO ALLO GOOD IN AND INFORMATION COMMINED TO THE POSSOCIAN OF GLANCE CONTROL IN COMMINE TO THE CONTROL IN CONTROL INCOLUR. IN CONTROL IN CO

#' GYXQ QWe^c UFU^d_c aeU^_ Ucds^^U5UQbQ| U^dUS_^U5dQT_c S_^cec SQecQc%L/d_^SUc cUfQQcUWeY%aeU XQ QWe^Qc S_cQc aeUfYU^U^ $Q`QcQbcY`^YWL^QSQecQXLV^S_^tdQTU/Qce`_cYSW^'D_bcYXQ; QWk^UFUYd_aeU^_VLUCDtQ] UYdUS_^USdDTQS_^VQYYWLU^SQTU/QSQecQXLV^SQTU/QceCQXV^SQTU/QceCQXV^SQTU/QceCQXV^SQTU/QceCQXV^SQTU/QceCQXV^SQTU/QceCQXV^SQTU/QceCQXV^SQT$ $\label{eq:local_local_local_local} $$\operatorname{U}_{\Delta} \simeq XQ -\Upsilon W^{2}_{A} = XQ - YW^{2}_{A} = XQ - YW^{2}_{A}$ $\label{eq:condition} $$ \graphi = \frac{1}{2} - QaeU - UbQ \graphi \graphi = \frac{1}{2} \graphi - Qgraphi - Qgr$] <u>````</u>; __\ucdQT__i \Q: S\\Se^\cdQ^S\Q:\ M_ aeU`eUTU\cUb\QSQecQi \Q\bQ\w^TU\ucdU\ubdQv_\W^\w] U^_\%e^aeU\ucdQTf\Ubc\\TOT\%eU\U^e^S\Q:\%\ UNUSci_TURU.cUMeY8%U^_do_^5:cUfYTU^dU`_b\Qce`_cY5Y4^TU.aeUUcdQUc_d_dQ{] U^dU.cY^^YMe^QSQecQ__ceU_'6aeuXQ; Q\W_U^\QV_b{}, Q `bucu^duTu\Quh'cdu^SqQTu\Qc_S_cQc% U,\ucdqT_TU,] e^T_%eUUc QRc_\edQ] U^du cY^SQecQ @_SeQ,Uc S_^ddqY_Q\Qce`_cYSW^% Q,S_^ddqY_ TU_ aeU cU XQTU| _cddQT_ Q^dUc' i U^d_T_c _c Qc` U5d_c U^U,] \(\); _ UcdQT_ i \Qc SYSe^\cdC^SQc' M_ aeU \\ eUTU cUb\Q SQecQi \QbQ w^TU UcdU \u00db _d_Q_]_U^dU_c/^ ^/We^Q_SQecQ__ceU__'6aeuXQ_QW_U^\QV_bi_Q^;bucU^dU_TU/QUhYdU^SQTU_QC_S_cQc%_U,UcdQT__TU,] e^T_%eUUc QRc_\edQ| U^dU cY^ SQecQ @ SeQ, Uc S_^ddQY_Q\Qce`_cYSYV^% Q,S_^ddQY_TU_ aeU cU XQTU]_cddQT_Q^dUc' i U^d_T_c _c Qc`USd_c U^\U,] 'k] _ UcdQT_ i 'Qc SYSe^cdQ^SQc' M_ aeU`eUTUcUb\QSQecQi 'QbQ w^TUUcdUUhddQv_W/w] U^_w] U__%Qe^aeUUcdQT**YU**bcYTQT%aeUU^e^SQc_%W \\U00dc_TURU cU\\00dc_0__5: c U\\TU^\00d_b\\00dc_c_c\00dc_0_c\00dc_0_c\00dc_0\0d

GUSSYu^\±'

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icY^_ ucceW5N/du`qxq`b_TeS1%QS_^dreQ5W/%_`b_TeSU/Q] Yc]Q'9U51%_S_^ddQbY_%UcTU51%%Q\`_TUb`QxQ5Ub_aeU^_XQ\`_TUb `QDQXQQUIb_'GY^_XQ;QU^e^QSQecQceVISYU^dU`_dU^SQUIZUGNTQ%;U^SYBer^cdq^SQc;ceVISYU^dU;`QDQ`b_TeSbe^UXU5d_%_b_aeUU;UVU5d_cU `b_TeSU_BUQ]_U^dU_U^e^}_]_U^d_4d_TQ;_UcdQ;_S_cQ;_8_^SeBUY^dU;%_b_TeSYbs^U,UVUSd_U^d_T_]_]U^d_'M_Q;u`_TU]_c_f_\fUbQ\QYYfUbcQ4_ U, UNUS_d_%_ cUTURU QaeU \Q SQecQ4Q] U^_c aeU U, dtU] `_ T\\tutu\^du cube^Q S\tse^cdQ^SQaeU dtu^U Y\\eu^SQ% Ub_ _ aeU Uc S_^dtQbY_ Q\Q ce`_c\S\v4`QQU_cUce`_1\uaeUd_TQc\Qc\S\Se^cdQ^S\Qc\aeU\r\\ei\U^\\c__c]\\c]_c' \M\QTU] sc\\\cd_c\ub\Qce`_1\ub\]_] U^d_TU\cub\Q $SQecQ4_SeQ.Uc.S_^dQQ^e `_cYSW^TU^Q_dQS_cQUc.^QSQecQ`DUb_cYcw__QTY^UbcYTQTTU^dU] `_ ^_dU^U ^YWe^QY^WeU^SQXW^d_SCQUc.^QSQecQ`DUb_cYcw__QTY^UbcYTQTTU^dU] `_ ^_dU^U ^YWe^QY^WeU^SQXW^d_SCQUc.^QSQecQ`DUb_cYcw__QTY^UbcYTQTTU^dU] `_ ^_dU^U ^YWe^QY^WeU^SQXW^d_SCQUc.^QSQecQ`DUb_cYcw__QTY^UbcYTQTTU^dU] `_ ^_dU^U ^YWe^QY^WeU^SQXW^d_SCQUc.^QSQecQ`DUb_cYcw__QTY^UbcYTQTTU^dU] `_ ^_dU^U ^YWe^QY^WeU^SQXW^d_SCQUc.^QSQecQ`DUb_cYcw__QTY^UbcYTQTTU^dUS_CYCW__QTY^UbcYTQTTU^DUS_CYCW__QTY^UbcYTQTU^DUS_CYCW_QTY^UbcYTQTU^DUS_CYCW_QTY^UbcYTQTU^DUS_CYCW_QTY^UbcYTQTU^DUS_CYCW_QTY^UbcYTQTU^DUS_CYCW_QTY^U$ Uf YTU^dU aeU Ut: S_] _] eSX_TU e^QRcebT_TUS18%Q SQecQ VeU ceVR5U^dU `QtQ`b_TeS16U, UVUSd_TUe^Q c_VQf Uj % ^_U^_db_4S_] _ `QtQ TUS18% $\text{aeUUc ceVSYU^dU^QL^b_TeSYbU,UVLSd_U^e^]} _ \text{I U^d_TUULII, YQT_\% c^U]} \\ \text{RQbW_^ Uc ceVSYU^dU^QL^b_TeSYbU,] } \\ \text{YQT_\% c^U} \\ \text{I UC ceVSYU^dU^QL^b_TeSYbU,] } \\ \text{YQT_\% c^U} \\ \text{I UC ceVSYU^dU^QL^b_TeSYbU,} \\ \text{I UC ceVSYU^QL^b_TeSYbU,} \\ \text{I UC ceVSYU^Q$ dt() `_'`QtQU_cUce`_^UaeUd_TQc\QcSt\$6e^cdQ^\$YQcaeUY^VeiU^%_^\c] 'x']_c' M%QTU] sc%ubd_cUbQce`_^UbU\]_] U^d_TUcUb\QSQecQ4 _ SeQ\ Ltc S_^dtQbY_Q\Qce`_cYSW^TU\Q_dtQS_cQLtc\QSQecQ DUb_cYcw_\QTYFUbcYFQFTU\dtu]`__^_dtUr\^YWe^QYYVeU^SQXW/d_^SUc Uc aeUUcceWSYU^dU`QtQ`bTeSYbU,UW56dU^e^]_]U^dTUdUbjYQT%icYUJRQbW^uceWSYU^dU`QbQ`bTeSYbU,]Y;]_UW56dQ,]Y;]_ dt() `_'`QtQU_cUce`_~UaeUd_TQc\Qc.St6e^cdQ^SQc.aeUY^VeiU^%_^_c] Yc]_c' M%QTU] sc%lcd_cubQce`_~UbU,]_] U^d_TUcUb\QSQecQ4_SeQ,UcS_^dtQb'_Q

, 'Ge` ^WQ] caeUXQ QWe^cUfU^dcaeUddrU^e^QSQecQi Ve^TQ] U^d TUce UhYdU^SYQ%aeUQx^^ Ucds^^U5dc^0 UrdUS ^U5dQT cS ^ ce $SQecQ\%Lic TU ce`_^UbaeU dU'U^e^Q SQecQ aeU^_Uc ce <math>SQecQ 6cu4cYU UVUSd_^c cuts ^USUcQtQU U'dU S_^USdUT__S_^/Q SQecQ\%6_^ce$ Y'\leu''SQ% \Qc S\be^ccq\^SQc Y'\lei U'\duc4U'\d_^S\uc96_] _ XU_RcUbfQT_ Q'\duc9\lc e^QS_cQ`_cYR\U i ce``_cQR\U/@eU\QSQecQQfUSUc`eUTU $\label{localization} \begin{tabular} $$ UZUSUD(Q) $$ Y = QYVEU^SQXU^Q = Y = QUYEU^SQXU^Q = YUQ = QUYEU^SQXU^Q = YUQ = YUQ$ SQ: Uc e^Q`beURQ%TUXUSX %aeU\QYYVeU^SQTU\QSQecQ^ Uc ceVISYU^dU`QbQ`b TeSYbU\UVISd'D bcYXeRYUbQcYT ceVISYU^dU%, XQRbuQXUSX' $M\%' U RCW\% b Qce`c'SWYW b Qce`c'SWQ] Y Q SQecQ%Q`UBUSSW' Q] Y Q Y WeU'SQ% SeQT d TQc Qc SWSe^cdQ'SQc aeU d'U'U'$ `b_TeS/bU, UW5d_' McY^_ \eUtQce\W5W^dU`QtQ`b_TeS/b_%U^d_^SUc \Q`b_TeSS/w^TU\Q] \text{\Q`_TbQ^_cUbTURYT_ QaeU\QY\\eU^S\Q%\Y_aeU $TURU \ CUDTURYIT_Q_dQS_cQ\%_TURYIT_QVQ^QTQ' \ McYU, UVLSd_^_ cUQTURYIT_QVQYYVeU^SQTUVQSQecQYMYd_d^SUc^_ Uc VQSQecQ' @ \ aeU ^_c \\UFQ$ $QQS $$ $$ ddQTSSW^TU = QSQecQ% cY^SQecQ%eUUc QdUbbQi QbQ w^TU QUWbdU^SQTU = QS cQ% Q,] Yc] $$ dU] ` ^ Uc QRQcUi QbQ w^TU QUWbdU^SQTU = QS cQ% Q,] Yc] $$ dU] ` ^ Uc QRQcUi QbQ w^TU QbQ w^TU QUWbdU^SQTU = QS cQ% Q,] Yc] $$ dU] ` ^ Uc QRQcUi QbQ w^TU QbQ w^TU QbUbbQi QbQ w^TU QbD w^$ $QWe^{\gamma}Q_dQ] \ Q^{\prime}UdQ \ DQDQUV_cUTU] \ _cdbwQ^{\prime}Ub^{\prime}QeU^{\prime}QVV_keU^{\prime}QQCQ^{\prime} \ VeU \ ceVIS'U^{\prime}U^{\prime} \ QuQ^{\prime} \ b_TeSIbU_l UWSd^{\prime} \ M \ CY^{\prime} \ VeU \ QeVIS'U^{\prime}UU$ `QtQ`bTeSt\,%J/d^SUc\Q`bTeSSt\^TU\Q] Yc] Q`_TbQ^_cUbTURYT_QaeU\QY\\@U^SQ%Y^_aeUTURUcUbTURYT_Q_dtQS_cQ%_TURYT_Q\Q $aeUU,UVLSQ_TUUcdQxdf_QYcdQ^SQ^_cUTURWQQQYWeU^SQTUQSQecQ%Y_aeUTURU/WQbQ^QcbQWe^Q_ddQ_QVLdQ_DQbQUl_cUTUI__cdbwQ^dLc%aeUQYWeU$ @\\RUadTTU\Qf_\e^dT ?_^QXQ^: Tg Q5Tc

$9U/Q8_^UhY_1^TU/_cQ_2^CCTU/Qf_e^QTS_^/_cTY_2^TCTU/Q8_] ` LU^cY_1^TCTU/Q8_] ` LU^cY_1$

 $: c] \ Q^{W} \ U \ d_{e} \$

:\9bKXXfRice`_^US\Q\$Q]U^dU%aeU_cQ\$d_ciTudubjYq\$Y_^UcTU\Qf_\e^dQTcYU]`\bucYMeU\\Q_`Y^%\^TU\Q\$_]`\buc\M^tU\Q\$_] $\begin{tabuler} $\tt ROU^*ULS_U, \begin{tabuler} \begin{tabul$ d] QT_ ^_QTU `_bU\Q +' : \WQT_ TU Q` LUXU^c\w^ TU\QS_] ` LU^c\w^TU aeU U, R\U^_ U,] Q,4aeU cU \CYSLU] U^Q\cdot _b\QQdU^S\w^i S_^c\text{HUQS\w^*} $\label{thm:continuity} EeUUtcdQUtce^Q_`Y^\W^U^QaeUcUUtcds UhSUT\W^T_`Ud\W^QbQ\%85_]_t \ Utcds U^SQTQ_`Y^\W^aeU] Q^dU^UU^ce S_^db_f Ubc\QS_^\c$ $SQfY^cdQc\$S_^TUc\pi ^TU/Q_^YYW^S_^dtQbQ%_]_QRcebT_i S_^dtQTbQ_bY_U^cu] Y:]_ (%) QtUSUts^Qc SWbYY^dUc ^QQRbQc %U^ce 9 Y:Sebs_1 = (%) QtUSUts^Qc SWbYY^dUc ^QC SWbY ^QC SWbYY^dUc ^QC SWbYY^dUc ^QC SWbYY^dUc ^QC SWbY ^QC SWbYY^dUc ^QC SWbYY^dUc ^QC SWbYY^dUc ^QC SWbYY^dUc ^QC SWbYY^dUc ^QC SWbYY^dC ^QC SWbYY^dUc ^QC SWbY ^QC SWbYY^dUc ^QC SWbY ^QC SWbY$ c_RbU_c_SYS_`e^d_e' 6X_bQ%bc_SYbbig%_aeU%QbbbQj_U^dU%XQSUaeUU\U^dU^TIj_Yb^d_TU`UbSRY8%bc`beURQ`b_`eUcdQ%_Q`bUXU^TYT_% $$$ $ \sim TUDT_c \ TUD$ $\label{eq:local_$] sc%_ aeU XQ\$U aeU \Q U,U,U\Ubs\b\c Q\U_Q` b_RQT_ `_bU, U^dU^T\] YU^d_4i U^S_^cU5eU^SQaeU Q`QbU\$U Q, Q,] QdQ^ReU^Q Md_T_ _aeU ^_ QT] YMWNLC QW_ bU` bUcU^dQT_ `_bU, U^dU^TY] YU^d_% QcuQ` QbUSU Q\Qf_\e^dQT%5_] _ U,] Q\' 9 U T_^TU d_T _ aeU 9 Y_c bUaeYdbU TU ^_c_db_c Uc i `eUTU.cUb.cw_ Ucd_4Q.TUcUSXQb_] Q_ i UcS_WUb_ ReU^_! D_bdQ^d_%TUS1baeU\Q`beURQ`b_`eUcdQ%Q`bUXU^TYT_% S_^cYTUbQT_%_ Uc @\\RUMDTTTU\Qf_\e^dDTC ?_^QX\Q^^: Tg\Q\$TC

Q`bRQb4 aeUU.] Qi bRYb^`b`eUcd%u,] Qi b] Q,Q] U^Q;QT %SeQ^T YM6Q] U^dU.cU.SUUUi cU.bUxUZQU^QTU,Q^dU% Uc.ceYSYL^dU `QtQS]`b]UdUb\Qf\e^qQTTUUUW16\ReU^iTUcUSXQb\]Q,%Uc%U^UVU5d%aeUTUSY8%aeU\x^6aeUTdK]fUb\Qf\e^qQT`QtQ $\text{U,UMb}_\text{TU | LUSXQ| Q$\%$_U$ ce\WS\U^3U^1U^2SXQbTU]}_\text{T}_\text{TU XQUA_c SeQU$_U$ S_tQTS_U$_U$_c\$$fURU ^UUC\bQ] U^3U $cub\Q$_cQ$. }$ Gt aeU QS $$'d'eQSW'UcQct'@eU \land Qct'@eU \land UcQct'@eU \land UcQc'@eU \land UcQc'@eU$ $\label{eq:control_control} $$XQSUb^c \cap YTC \cap CQQCYdbQUV_c\% \ Ub_^ \cap UTU_RCdQSeVY \ Qb^eUcddQS_^FYSSW^SeQ^T_XQSUJ_c \ Q`UUXU^TUb_c\% \ QdU^TUbQ \ QdV^TUbQ \ QdV^TUbQ$ U_c'&cU dQdU%aeU ^_ Ucds U^^_c_do_c dQ_RYs^e^Q\bU^YdU^Si_Q_RYb^XU]_c TU U\UMbHaeU cw_ ^_c `eUTU YTYs`_^UbQSbUUbaeU Us% aeU\ Q`beURUS] ^eUcdbQR ^TQT]sc WbQ*TU MQcUQ%aeUc] c`b`U^c cQ,]Q,aeUTURUJ cTUS\Y\Qb4aeUcw\`eUTUXQSUbQ] sc TW6%\`QtQ^c_db c SbUUbaeUUcU\`U bTU\ c] QUc' DUb %\YU] RQbW %_aeU cubUQ] U^dU SbUU] _c aeUUc ^eUcdtQ R_^TQT] sc WtQ^TU%Qx^cUts^U,UMT c4i \ aeUQ`tUXU^TU] cQcUbU,`U bTU\c]QUc%Qf \e^cQT%)YU^dtQcaeUcuS ^dfeQts RQZ \QS ^fYSSW^ $TU aeU c UbbluSXQ; QT_ `_b ^_c_dv_c' D_b \setminus dQ ^d \% eU TU c Ubx ^6 _bluae 't 'd '% - ^U, V ^T TU Ucd_c Ubdlu] _c 'meU U, 7 eU ^: c` ubde TURU `_b _ c 'd '% eU TU C Ubx ^6 _b Ubae 't 'd '% - ^U, V ^T TU Ucd_c Ubdlu] _c 'meU U, 7 eU ^: c` ubde TURU `_b _ c 'd '% eU TU C Ubx ^6 _b Ubae 't 'd '% - ^U, V ^T TU Ucd_c Ubdlu] _c 'meU U, 7 eU ^: c' ubde TURU `_b _ c 'd '% eU TU C Ubx ^6 _b Ubae 't 'd '% - ^U, V ^T TU Ucd_c Ubdlu] _c 'meU U, 7 eU ^: c' ubde TURU `_b _ c 'd '% eU TU C Ubx ^6 _b Ubae 't 'd '% - ^U, V ^T TU Ucd_c Ubdlu] _c 'meU U, 7 eU ^: c' ubde TURU `_b _ c 'd '% eU TU C Ubx ^6 _b Ubae 't 'd 'meU Ubx ^6 _b Ubae 't 'd 'meU$ Ye] YU ^eUcdo_U^dU^T\] YU^d_%aeU_QdU^TUbi_dU^YU^T_U^SeU^qQ_aeU Ucds_Q^dU ^_c_do_c%TURUTUdU^Ubi_UcdQbS_^fU^SYT_c TU ^eUcdo_ $TURUB4i\ aeU\Qc\ RU^TDS'_1Uc\ TU.:\ fQ^WUY_TURU^cUb`_bV_\ b_`ecYUb_^`QtQ^_c_db_c%\ QaeU`_TUJ_\ c\ TCSUb^bQcUb^eUcdQ\ R_^TQT$] sc $WKQ^TU4i \Qc] YUDQc TUH>XKUQU^UXYVU] Q^UDQaeU`_TU] _c UcdQbcUWeb_c TU aeU U_c c_^U,`U_bTU_c] QUc4aeU`_TU] _c$ $\label{eq:linear_line$ `b_`ec_% U\] Qi_b] Q\QI U^Q|QT_%5eQ^T_ cUSbUU`_bYMeQ\i cUbUNUZQU^%bc ceYBYU^dU`QQS_]`b_] UdUb\Qf_\e^dQTTUU,UMbU\RYU^ i busxq Qbu\] Q% uc aeu c_\ _c aeu T_dk] _fub\Qf_\e^qqTTUU\UMb_ busxq Qb4i aeu uc S_^ddqT5d_bY_u^cu% QqQce`_^ub_ $S_\Delta dQM_4i `_b \ dQ^d TURU ^USUCQMQI U^dU CUbVQcQ4i \eUW \ aeU cubUQ] U^dU SUU] _c aeU Uc ^eUcddQ R_^TQT] sc WWQ^TU d_TQFuQ$ cubs U,UMMT % \ aeUQ`bUXU^TU] cQcubu\`U bTU\c]QUc%cubs%Q\]\t] dtU] ` aeUS ^d/reQ] c RQZ ucQS ^f\SS\w^%cub LUSXQ|QT_`_b^_c_do_c'BQTQ`_TbQXQRUbcYT_TYSX_]sc`QtQU\`b_`wcYf_%dQ\]U^du`QtQc\WYW\$Q\$%aeU\QcTUdbl)YQ\$Y_^ucTU\Q $f_{e}^{T} = \frac{1}{2} \left[\frac{1}{2}$ `b_`eUcd_%SQSe\Q^T_dQ^d_U\WkQT_TUReU^QiU\]Q\U^dU^TYT_%U\WkQT_TUU^dU^TY}YU^d_%QfYc_%\QS_^fYSSW^TUaeUXQ`b_`eUcd_ U, RYU^i U,] Q;4i aeUUc `_b_ dQ^d_ ^USUcQbQ\ U^dU% `eUTU cUbTU_dQ\] Q^UbQ%J^^^YWk^SQc_%_bSeQ^d_ cU Q;Xi\ Q%aeU^i\] `\\SQ e^Q S_^dtQT^\$SYv^% QtQ ce`_^UbaeU QWe^Qf Uj QcUbTU_dtQ] Q^UtQ

Gi cU^c/NUNAN_RZUST_TUN9_Sd_bU^S_^dbQTUULCCC QXG QSY_*ULC UC U, SQFY^CdQ4]_cddQXNJ^_`_CSSW^QUN_c%eU^_UXQ ^USULCYTQT TU ^YWe^Q_` UbQSW^WC*SQTU: c` ubde TU9Y_c U^\Qf_le^dQT% QbQSQ] RYQbi TUdUdj YQbaeUQe^QReU^QUULSSW% Ub_aeU U ^YWe^SY_^Q] YU^d_i \QQ eTQTU9Y_c Uc cw__]_bQ%_aeU ceWCbUUNTUC Q\Q8_] `BU^cW^4aeU ce`_^UcUbceWSYU^dW&YUCQ YTUQc c_^QUUTYT_c%^VQNR\U` QbQ_RdU^UbUN YYQ! DUb_SeQaeYUbQaeU cUQce TYcW_ UbQ%QTQ` eUTU cUb] sc TYBuSQi `\U^Q] U^dU%aeU SQTQ TUdUdj YQSW^TU\Qf_le^dQT%DYWL CUSWYQF QTUUC QYQ 4TYBUSQJ U^dUV~S_^dbQTU ce` b_`YQ^_SW^TU\QNRUbQT TU\Q f_le^dQT%DYSW^TU\Qf_le^dQT%DYGTQF QTUUC QYQ 4TYBUSQJ U^dUUC%YWEU VQLe^dQT% aeU cUQe^QS_^dbQTYSW^CUVQF QT \U^dUYYQF \\ \footnooning \footno

@\\ruador τ∪\Qrf_\e^qdor ?__^QX\Q^^: Tg QbTc

 $\label{eq:condition} $$ ^\Upsilon S_cQQWe^Q`UddU^USU^dUQVQSeVQTWe^Q aeU`UddU^USUQ_dQVQSeVQTWSei_cQSd_cbuS_bbubQ^dUcTUVQf_\e^QQTWU^d\\ \underline{d}_ccecQSd_c% W_RUb^Qbi TUdUQ_YQbQc'$

 $6aet/\&c/YQi \ aeU \ Luc`_^TW/\%aeU \ c/YR/U^- \ Uc \ SYDtd_\%aeU \ TU \ QseUtT_ \ S_^U, T_Sd_t/\&QTUUUt] \ YQSW/^V/Qi \ TU \ Qf_/e^dQT \ TU \ U^TU \ c/YU] \ `tb/% \ Ucds$ S ^USDOT S ^YVQXXVJ UMU%QS ^YYSSW^TU,UMUMTY YUM % U,QYYC TU,] Q bRYUM4CYUJ RQ\$W %, c Q\$d c TU \Qf \e^qQT ^ c ^ ^U\$UcQ\$Y c4 $TURM = QaeU QS - YBSYW^TU, U^dU^TI YU^d TU U^TUU^`BI Ub/eWQbU^e^Q/U Q^dUBY bTU/Qf - k^dQTYM^/QTUdUB YQSW^TU d] Qb^_dQTU/_c$ $\label{local_loc$ $U^* U C d Q A Q R U d D T U Q f_{e}^d D T S_^c C d U U^* a C U S Q T_9 Y_C T C U d Q C C U S U V (A U A C U T U C A U V A C U T U R U A Q U A C U T U R U A Q U A C U T U R U A Q U A C U T U R U A Q U A C U T U R U A Q U A C U T U R U A Q U A C U T U R U A Q U A C U A C U T U R U A Q U A C U A C U T U R U A Q U A C$ $QdU^SW^TU/Q] \ U^*QU/QU_{-}^{\prime} \ BQTQ^*eUTUCUb] \ sc \ Tir RY_i \ VQ_iQTUS_^cYTUQSW^aeU e^QUUC^*UUcdU dY_' \ DQDQ aeU/QYU \ Q^*UUY_bTU/Q$ $f_{e}^{-1} = \frac{1}{2} \left[\frac{1}{2}$ $\label{eq:cecond} \begin{tabular}{ll} $$ c'U' = ^QSd_TU'Qf_e^QT'NLC e^QSd_TU'UUSSW'_LUSXQ'_'M`_bL_QQ'd_%c'N_aeUU,T_Sd_bQXB_QcUbfUbTQT'NLCds_TUUUSSW'_LUSXQ'_'M'_bL_QQ'd_%c'N_aeUU,T_Sd_bQXB_QCUbfUbTQT'NLCds_TUUUSSW'_LUSXQ'_'M'_bL_QQ'd_%c'N_aeUU,T_Sd_bQXB_QCUbfUbTQT'NLCds_TUUUUSSW'_LUSXQ'_'M'_bL_QQ'd_%c'N_aeUU,T_Sd_bQXB_QCUbfUbTQT'NLCds_TUUUUSSW'_LUSXQ'_'M'_bL_QQ'd_%c'N_aeUU,T_Sd_bQXB_QCUbfUbTQT'NLCds_TUUUUSSW'_LUSXQ'_'M'_bL_QQ'd_%c'N_aeUU,T_Sd_bQXB_QCUbfUbTQT'NLCds_TUUUUSSW'_LUSXQ'_'M'_bL_QQ'd_%c'N_aeUU,T_Sd_bQXB_QCUbfUbTQT'NLCds_TUUUUSSW'_LUSXQ'_'M'_bL_QQ'd_%c'N_aeUU,T_Sd_bQXB_QCUbfUbTQT'NLCds_TUUUUSSW'_LUSXQ'_'M'_bL_QQ'd_%c'N_aeUU,T_Sd_bQXB_QCUbfUbTQT'NLCds_TUUUUSSW'_LUSXQ'_'M'_bL_QC'_AUX_QC$ `_bQ\W_TU\ejQ^du5UTU^dUU^U\U^du^TN_Yu^d_c_RbU\U]Q_bRYb^Q`QbU^dU_]Q\'DQbQU\Qed_bQXb(]QaeU\uc\ucQ\ejaeU c__T_kK]_fUb\Q f_le^dQTTUUUWNb_lbUSXQ QblM`_b_dQ^d_lQf_le^dQTTURU.cub]_f\T_`_baeU%U^\QU\USSW^TU.Qc\cdbQ\Q\lej_RZUdfQ_\busYT_%6_^U\\Y^TU _dQS_^cUSeU^dUQSd_TUU\USSYW^3`_b_aeUUcdUQSd_^_Uc]U^_c ^USUcQbY_aeUU_do_'McYce`_^U]_c _do_QSd_TU\Qf_\e^dQT%\YYT_ _c] Yc] _c` bYSY`Y_c%cUTUdubi, Y^Qbs Y^Q\R\Uj U^du`_bQ\Wk^SYbbi_WbQT_TU\ej U^\U\U^U\T\Y YU^ij_c_RbU\U\] Qi_bRYU^ M ce`_^WQi _c aeU] $eSX_c QSd_c TU/Qf_e^dTMeeU/U LUSUTU_db_%_aeU^c '/Q; SQ%cYU] RQbW_%U/_c SQTQe^_ TUU/_c ^USUcQbQ| U^dUTUdUb| YQTQ `_be^$ $SYDDd_WKQT_TU/ejU^{QS_1}`bU^{QSW^S}_0U,]Q_bi]scS_TKSQT_RYU^U^UcUSQc_4iQcu%Ye^_TUU_c/RBUTUQSeUbT_S_^{Q}$ ^ SYW^TU\Q\YRUbbOTTU\9BKXXBRI'McYcU`eUTUTUSYS%QbQjw^TU` baet\cX]Rbbc^QcYcUPQ\Q\ejSU\URbOT ceSUcYQjUYdU%bcTURYT Q _c XsRYd_c ^_Sf_c S_^dtQtDT_c `_b] Q_c Q8d_c S_] UdfT_c Q7duc%6_^_ aeU cec] U^duc Ucds ^YTYc`eUcd_c Q.S_^cYTUbQb\Qf UdTQT \\Uf wQ.SQR_ $\text{ceSUcYQI U^3U QU}_{\underline{C}} \text{CMQTYMSe/dQT} \overset{\wedge}{_} \text{Ucds U^$QRc_{ed}} \text{U'YQRc_{ed}} \text{U'YQR$ QSd_c TU] QTQT5 9 URU%_b_c `b/SY Y_c TU,9 b K XXXi % YU*T_U\`e^d_TU fYxQ TU, U^dU*TY] YU*d_c RbU U,] Q _bRYU^i U,] Q' GYUcdu `e^d_TU fYcQTU\U^U^T)| YU^d_TUaeUcUQc_\c%aeUT_dK]_fUb\Qf_\e^OQTQU\UWb_bU5XQ|Q\$%6_]_Q\$XQ|QU\T_5d_b%QS_Od^eQ\$X0^%\$QTQQ\$d_TU $\label{local_continuity} $$ UUSSW^{_1}_bUSQ_^3U^b_U UQU^cdU^SQTUe^X_] $$ UUSSW^{_2}_bUCdU^e^d_TUf^cdQ^d_UCdU^e^d_TUf^cdQ^TUQS_] $$ U^cW^{_3}_bUCdU^e^d_TUf^cdQ^d_UCdU^e^d_TUf^cdQ^TUQS_] $$ U^cW^{_3}_bUCdU^e^d_TUf^cdQ^d_UCdU^e^d_TUf^d_UCdU^e^d_TUf^d_UCdU^e^d_TUf^d_TUf^d_UCdU^e^d_TUf^d_UCdU^e^d_TUf^d_UCdU^e^d_TUf^d_UCdU^e^d_TUf^d_TUf^d_UCdU^e^d_TUf^d_UCdU^e^d_TUf^d_$ $TUUJ_SY_^QAUI: aeUBWUU,QSd_WTURU.cUbQAUC.TU,QSd_M^{`}bV_dQAU_WQf_ke^dQTUC.AUSUCQbQJ_UAU.TUdUbJ_YQTQ%U^SQTQ.e^_TU.cec.QSd_c%$ f_\e^qQTU^QRc_\ed_':\SeQ,Q\QfUjS_]`\udQ]U^dUce`b\jUd_TQUcaeU]QTU\Q\\RUbqQTTU\Qf_\e^qQTTU\]tTN6_4iU%TUe^c__W_\`U%KQ S_baQT_\cdU^T_^UcTUd_T_ccecQb/ke]U^d_cTU\QR_^TQT%QZecdSQ%QWTU\YTQTiQcYSUbYTQTTU9Y_c%U^cecwbTU^Uc%b_]UcQc%0]U^Q;Qc% $Se'(Y^T_Q9Y_CTUYZECdSQ)QYVNTUNTQT%QXY_SULuQ%QVQQQQ(VQSDEUTQT'(VQNRUddDTTUVQf_/e^dDTTU,X_]RUU4(XQXUSX_UVQSQ(VQQSQ)(VQSDEUTQT'(VQNRUddDTTUVQf_/e^dDTTU,X_)RUU4(XQXUSX_UVQSQ(VQQSQ)(VQSDEUTQT'(VQNRUddDTTUVQf_/e^dDTTU,X_)RUU4(XQXUSX_UVQSQ(VQQSQ)(VQSDEUTQT'(VQNRUddDTTUVQf_/e^dDTTU,X_)RUU4(XQXUSX_UVQSQ(VQQSQ)(VQSDEUTQT'(VQNRUddDTTUVQf_/e^dDTTU,X_)RUU4(XQXUSX_UVQSQ(VQQSQ)(VQSDEUTQT'(VQNRUddDTTUVQf_/e^dDTTU,X_)RUU4(XQXUSX_UVQSQ(VQQSQ)(VQSDEUTQT'(VQNRUddDTTUVQf_/e^dDTTU,X_)RUU4(XQXUSX_UVQSQ(VQQSQ)(VQSDEUTQT'(VQNRUddDTTUVQf_/e^dDTTU,X_)RUU4(XQXUSX_UVQSQ(VQQSQ)(VQSDEUTQT'(VQNRUddDTTUVQf_/e^dDTTU,X_)RUU4(XQXUSX_UVQSQ(VQQSQ)(VQSDEUTQT'(VQNRUddDTTUVQf_/e^dDTTU,X_)RUU4(XQXUSX_UVQSQ(VQQSQ)(VQSDEUTQT'(VQNSQ)(VQSQ)(V$ $fQ^c c d T c cec UnSQIQSY^Uc S_AtQQT StateQTU c SQfY^cdQc%6] Sel^QT_Q9Yc TUYZectISQ]Q^MUCdQXQYVITU\TQT%QXY SUUcuX%Q$ VQQSQI \QSbeUTQT' i \Q\YRUbbQT TU\Qf_\e^qQT TU\X_] RBU4i XQXUSX_fQ^_c d_T_c cec UhS\Q] QSY_^Uc S_^dQ\QT_Sbb^QTU_c SQf\^\cdot\%\Q]_

6aeuXQ _dbQQdb^QdfQ% Ub_aeU bLSebbbQ\QfYUZQQRcebT_TU e^QTUdblq YQSW^Q^dbc TU aeU_db_% \QSQecQTU U_4i _db_ i U,Q]QcUQ\YRbuS ^buc`USd Q\QaeUTYSdQ^%u^\Q^S%w^Qb]Y^YQ^ TU\Q\YRUbdQT4U^d^SUc%Q^ducTUaeUUhYcdUTYSdQT TUce Undurnj Yund Tu, Qj QXTU] QrubQf \endbQi TuQSeUbT Qce`b`YQUUSSMrTUdUd YQXUnd T c\cSQc c%, aeUTSdQrTu, : $^{\text{AUTN}_{\text{I}}}$ $^{\text{YUNd}}$ cubs $^{\text{ATU}}$ $^{\text{AU}}$ $^$ TU cUb^USUcQbQc' 6cuaeU XQ e^QTUdUdj YQSW^TU/Q] U^dU Q^dUc TU aeUTYSdQ^TU/, U^dU^TYj YU^d_1%e^QSd_TU U/USSW^TU/b \\RbJ_TU\Qf_\e^dQT\%dQ|RYL^TURU\cub_]Yc]_S_^_db_x\df__TV6dQT_TU\Q8_]`bJ^cYx^3oM\cY\Q]U^dU\dQ]RYL^cUb\\RbJ\U^UcU TSQT TUU^dU^Trj YU^d %aeUTURUcUbTUdUg YQTQd TQfuQ` b db 4i QcuXQcdQU,YYY^d'6TUj sc%YU,TYSQD U^TU\Q S_]`bu^c\m`i\QTUdUbj\^QS\m`TU\QcUbs_U\]\ti]_%\lod_S_^\e^*TUQ\U^dU*TYj\Yu^d_if_\e^d\DT%\\Lc XQSU\Q]\ti]\@\MQcUdbQdU U^e^`_TUbTU Qed_TUdUd_YQ5W^U^U,U^dU^TY] YU^d_%RBU TU_d_TQ ^USUcYTQT4cUbYTU U^TYU^dU%_ TUdUd_YQTQ`_bSeQaeYUb S_cQQYdUcTUcec`b_Y_cQ&d_ciTUdUdjYYQ&Y_^Uc4iSeQYd_] sc\Q\$_]`bU^cYW^Uc`_b_dQYd_Y*TU`U^*TYU^dUic_RUbQ^_c_RbU $TUN: \text{$'$} \text{$ VQ5\\YTQT TUZej WQb\% Q cUQTU QSeUlbT S ^\Qc` `beURQc% U^S ^dbQTU U\\Q4aeU dbU^U e^S] Q^T c RUbQ^Q

GYQ\RUbdOTS_^cYdUU^aeUU,aeUU,aeUQj_Y^Q^ c ce`_^U^%QcQRUbU^\Qf_\e^^dOTTUTUdUbj_Y^Qbcec`b`YcQsdc%dU^U^T_ _`_bde^nTQT/YRbUi UcdQbcY^d_TQ~USUcYTQT4Ucd_Uc_]Y;]_aeUTUSY%aeU/Q/YRUbdQTS_^cYdUU^`_TUbdU^UbU,Qj]Qi/Q _`_bbe^nTQT TU dU^Ub_ aeU \Qc TUdUd\ $YQSY_^Uc$ TU \Qf_\e^qQT aeU \U `\Q SQ McY\Qc TUdUd\ $YQSY_^Uc$ TU \Qf_\e^qQT% _c x\d\]_c TSQT_CTU, U^dU^TI_YO'd_%UQU.] Y:] _%I/d_^SUC \Q\\RUbaQT S_^CYXUU^\Q] U^dU aeU dU^U U\`_TUbi_\Q_`_bbe^YTQT TU U\UMbcec `b_`Y_c TYSdQT_c TU_{QS_] `Bu^cYw^ DUb_ Ucd_Uc QRcebT_4`_baeU Uc `QxQXQSUb\QTUdUb] Y^QSW^TU U\USSW^Q^dUc TU, TYSdQT_TU QS_1 but the indicated in the continual of the continual contin] Y:] Q

f_\e^dqT%TU.ce S_^UhYw^^UsUcQbQS_^U, x\dfi_TY6dQj U^TU\Q8_]`\bU^cYw^%ce`_^UUcdU.x\dfi__^_cubs_TYWbU^dUTU\Q@vi_TU\Q $f = \frac{1}{2} \int \frac{dy}{dy} \int \frac{$: "AUTH) YU'd CUQ(Q] Y:] QS ^\QTUBUB) Y'QSW^TU!Qf \e^AQT U^CUNLYd ^SUC \QUHYEU\^SQTUUCQTUBUB) Y'QSW^TURU CUB^USUCQDQ $\text{U^SeQ^d} \ Q \ Q \ f_e^{\text{d}T4U^{\circ}} \ dQ^{\circ} \ aeU \ Q \ f_e^{\text{d}T} \ f_e^{\text{d}T} \ dU^{\circ} \ dQ^{\circ} \ dU^{\circ} \ dU$ S_cQTUc`et c TU aeU UhYcdU%_ d'Ur'U ^YWe^Q_`_bde^YFQT TU TUdUd] YQbU^SeQ^d_ Qce`b_`YQUhYcdU^SYQ4i QUc TU] QcYQT_ dQbTU`QdQ Uc'

: \9 b GQ] eU, 8\Qt[%J^ce TU] cdtQ5W^TU, cUbi \ c QtbRed c TU9Yc% QtQUfQT\bU, QtMe] U^d `QtQTU] cdtQ5\Q^USUcYfQT TU\Q

@\\ruadot τ∪\Qf_\e^dot ?__^QX\Q^: Tg QbTc

GUSSYi^L'

@Qf_\\SY\^^USUE\QBIQI_U^dUS_^USUQT_S_^\QY^\\eU^SQTUA_df_c3S_^_RcULfQSY_^UE`\QbdSe\QbuE\QY\Q\^ YS_^C\td\^SYQTU\Qc\Qbd_QSY_^UE`LQ__^Q]_YD^d_cTU\Gb\8X&RR\QSULSQTU\Q\\RULbQT\TU\Qf_\e^d\QT

@\\RUG\\TU\\Qf_\e^^\ta\T = \\\Qf\\Q^^: Tg \\Qf\\C

M%Y`U] RQ!M_%Q,] Y;] _ dU] `_% _bce UcaeU] Q%QY\\eU^SQTU A _df_c c_RbU ^_c_db_c `Q!QUhStQbQ\QQSSW/% QcUQU^ $\frac{1}{2} \frac{1}{2} \frac{1}$ U\\Q%aeUU^dTQc\QcQSSY^Uc\\RUUc\QcUbQcu $\label{eq:continuity} $$ GUU\WW%YFQQSe] `\bcU^qQQQfcd%_24i SeQ^T_cU`bbcU^qQ^fQ&c]_df_c%cUU\WWQaeU $$ Af SeQ^T_cU`bbcU^qQQfcd%_24i SeQ^T_cU`bbcU^qQQfd%cd%_24i SeQ^T_cU`bbcU^qQQfd%_24i SeQ^T_cU`bbcU^qQfd%_24i SeQ^T_cU^bU^qU^bU^qU^qQfd%_24i SeQ^T_cU^bU^qU^qQfd%_24i SeQ^T_cU^bU^qU^qQfd%_24i SeQ^T_cU^qU^qU^qU^qQfd%_24i SeQ^T_cU^qU$ SUTUBS Q% aeUcUfQQbUSXQ Qb#DsW+,/\$H_T_X_] RbUdW^U`_TUB`QbQGdeQb_QRcdU^UbcUTUQGdeQb%QWbQTQRUJ U^dUS_^% $S_{t} = 1.5 \ d_{t} \ d_{t}$ `_TUB% Uc dQ^d_U^\RUbdQT% QbQ bUSXQ;QbU,]_df_aeU`bUfQUSU%QaeUdW^u`_TUbidU^U\Q\RUbdQT%QbQbUSXQ;QbUc_c] off caeU^\ XQSU^;#MQcu%',*)%**'\$Q\Y^TUS ^cddeYbe^QQ\WU^dU] bQ%\Lc^USULcQdY%aeUTURUbuQdU^UbU\` TUbTU QSdeQb QRcdU^UdcUTUQSdeQt%U^dQUc] df c] bQUc aeU\U`\Q SQ;M`QtQU\`b`wcYd %5] U^] eSX c db c\eWQtUc'9U YYKeU^SQ`bUT] YQ^dU% cUTUdUbj YQU^`bij Ub\eWQb` bU,`\QSUb \QU,USSW^TU\Q] U^dU%aet] aff ccu`eUTUYTeSIb` b% Qndub TU aeU cU YTeSU` bU\\ c' 6X bQ%Swj `eUTU^S \WQbUbdQb S cQc 2endQb 5 o8 wj `eUTU\Q] Undu Dbij UbQbd % `bce $\begin{tabular}{ll} QSd_TUf_\e^dQTi_\QUUSSYW^TUddd_YQ^aet_]_df_c\cuts^U,\ceU_i_\QbQ_w^TU_cef_\e^dQTi_\UUSSYW^5DQbQ_Ucd_ce`_^U%QBQ_Ucd_ce(C)_UCd_UCd_Ce(C)_UCdQ_Ucd_ce(C)_UCdQ_Ucd_ce(C)_UCdQ_Ucd_Ce(C)_UCdQ_Ucd_Ce(C)_UCdQ_Ucd_Ce(C)_UCdQ_Ucd_Ce(C)_UCdQ_Ucd_Ce(C)_UCdQ_Ucd_Ce(C)_UCdQ_Ucd_Ce(C)_UCdQ_Ucd_Ce(C)_UCdQ_Ucd_Ce(C)_UCdQ_Ucd_Ce(C)_UCd_Ce(C)$ U,USSYM^iQUcdsXUSXQ%Q^ducTUaeUU,] df_dYC/UceUVUSd4iaeU\Qf_\e^dQTcUUZUSUiQ%Q^ducTUaeU`bUfQUSUU,] df_%TU] Q^UtQaeUU^bUQ\TQTcUQU\ceU\TU\Qf\e^dQT4iXQSUbaeU\Q`bUfQUSYU^dUU^U\] df %QS ^cU5eU^SYQTU\Qf\e^dQT%TU _c SeQ\Uc%Y^U] RQ\$W_%Uc U\ceU_' GY\Q] U^dU i QXQU\UNNF_ `Q\$QSe] `\YbS_^e^}]_df_% `Q\$QSUTUbU\`Qc_ Q ce U^decYQc]_%Q U] SW^

fYU^UU^TU] QcQT_ dQbTU% Uc Y^^USUcQbQTUc`et c' GYQ] U^dUi QXQ_`dQT_`_bSUTUbQe^]_df_ aeUYfYdQQe^Q
S_cQ%_ aeUY] `\Y\$Q% TU XUSX_ Uc%e^QU\USSYW^TU_ YSYBWQ4i U\ Q\$d_TU U\USSYW^Uc Q^dUc TU aeU\QYYVeU^SQTU\
]_df_ aeUYTeSU% Uc U\ Ve^TQ] U^d_TU\QU\USSYW^4Uc U\ X\ZTU Q^dU] Q^_ S_^U\ `QTBU aeU_ U^WU^TBQ8\QU\USSYW^cU
ce`_^U aeU Uc U\ Ve^TQ] U^d_TU aeU\QYYVeU^SQTU\]_df_%aeU cU ce`_^U] ei YYVeU^SQQcUbU\ Ve^TQ] U^d_TU\Q
U\USSYW^ M QcufYSUFUbcQ%QU\USSYW^cU ce`_^U aeU Uc \QS_^cUSeU^SQTU\QYYVeU^SQTU\]_df_%aeU\QYYVeU^SQTU\
]_df_ Uc \QS_^cUSeU^SQTU UcQU\USSYW^] Y:] Q

@\\RUadTTU\Qf_\e^dT : Tg Q5Tc

>>>+6e^aeUU\Gb8XeRRQXK]Q%5_]_U\Q^dubY_b%aeUSQTQf_\SYM^dU^UQWk^]_df_% aeUU^\Q^QdebQUjQTU\QS_cQ%c^ff_\SYM^dU^UQWk^]_df_% aeUU^\Q^QdebQUjQTU\QS_cQ%c^ff_\SYM^`eUTUdU^Ub\eWQbcy^QWk^]_df_`QQyYTeS\b_4 cy^U]RQbW_%QXd]QaeU\Qf_\e^dQT_^ cYU]`bUc\WeU\Q]_df_]sc\edubUbUdU_4_%U^_dbQc`QQRbQc%_cUb\WU`_b^YWe^Q\edubjQce`UbY_bTU\]_df_ aeUcUc\WeU%]scQ\s TUA_df_cU^cU^df_S_dbQbY_%Q^dUbY_bUcQ\Q`b_`YQf_\e^dQT'Gec`b_`YQc`QQRbQc#BsW+:1'\$c_^_cc\WeU\d33

6 `LCQbTU_ aeUcUBUNKUBUQ\Qc SQecQc \KrSQc%_ aeUUc] sc \eUbduc\J] `BU \BU \KU\GUSU%\Y\ J] RQBW_%Lc_dQS_cQS_^BUC` US_QC \QC SQecQc]_\LQUC SQecQc \Landbar \KuSuc \Landbar \Land

 $DUb_UcdCcS_cQc. ^ `eUTU^UcdQbZe^d_c' = Qie^QTY^UbcYTQTTU^eUbjQU^A_dYi_cTUUUUSSW\% BUFY_QQUUUSSW^ \\] Yc] Q: \ 'b_`Y_Gb 8 XeRR ce`_^U%aeU ^_YFYDQ^QdUbY_bj_U^dU%TESU^%UhSYD^% TYC`_^UbQ]_U^dUQQSSW^': cd_ \\ Yj_ `YSQ%aeU dU^U^QW_U^cu]_Yc]_c aeU cUYYFYDQ%SYUbQdU^TU^SQQYTESbi_TYC`_^UbQf_\e^dDT_`bUFYQQ\Qf_\YSW^U^cubW AUMOT_c\]Yc]_c ucdQ^QbebQUj_Qi_dU^TU^SQ%cY_TeTQ%_dU^U^U^SYUbd_c WbQT_c\]Y_YDT_c%aeU c_^SQ`QSUc_TU\QTY*UbcYTQT4i_QWe^_c _c _dU^U^U^U^]_Qi_bWbQT_%U^_db_c]_U^_c4i__c aeU dU^U^QQ]_Qi_b`QbuUTU$

@\\#Uadot \to\Qr_\e^dot \rightarrow\Qr_\e^dot \rightarrow\Qr\. Tg\QbTc

 $\label{thm:condition} $$ UcdQdU^TU^SQ\%_^cYTUtQTQS_^dTQce^QtttQUjQi_VCcSY55e^cdQ^SQc_Q^dUtY_tUc\%Qf_\e^dQT\%_^_c]_df_c] sc VeUcdUc%_\c\\ aeUdU^U^]_U^c\%_^_c]_df_c] sc Tt RYUc'$

 $6X_bQRYU^{\circ}\&YQf_e^{\circ}dQTQfUSUc^{\circ}_cYWeUU,]_df_aeUUc]sc VeUbdU%_dYU^{\circ}UdU^{\circ}TU^{\circ}SQ]sc Q^{\circ}dUbY_b_fU^{\circ}dQZQ%S_^cYTUbQ^{\circ}T_$ d TQ: \Q: S cQ:\% QtQ\^TeShb \ UnShQt\%\ Ub \ c\\\ell\vell\unlikel\unl] U^ c dU^TU^SQQYTeSbU\Q4U^UcdUT Se] U^d \Qf \ e^{Δ} QT Q5dkQQ`QUU^dU] U^dU cY^] df U^ ce d dQ\TQT%Y^Y\\ell^Q\bQ\ w^ `bUf`Q`QbQTYC`_^Ub\Q]U^dU`QbQaeU%_^dbQbQ]U^dUQ_aeUce`_^UU\]Y]_Qed_b:\Q\$d_%U^U\aeU\Qf_\e^dQTTURU `b_SUTUbcY`e^]_df_ Q^dUbY_b`QbQY*TeSYbaeU%Uc U\Q&d_TU`bUVUbbU\]_df_] sc Tt RY(D_b_QRcebT_ Uc TUSYb%Q] U^dU f U bQ; w^Q^dubY_bU^U\] _dff_%Q`bU\UbbaeUU\] _dff_Q^duc aeUU_db_4i Q\] Yc] _ dfU] `_ `QbQ ce`_^UbaeU ^_ XQi ^QTQU^U\] off %U^ce ^QdebQUj Q%UcdQT % SeQaeYUbSY8Se^cdQ^SQTU\QaeU cUQ%QQ i S] Ucds U^\QfYcdQ`bUfYQTU\Q] U^dU%aeU\UTQ $\Upsilon We^Q \ UUUSQS ^UQU^SQS ^UQ$ $] \ Q_b \ Q^b \ Q_b \ Q^b \ Q_b \$ $\label{eq:continuous} $$ Uc c^TeTQ_dQ^d_S_]_TUSYM_h^cdU e^dUddu^_Q^dUdg'bi_Qdg_w^U^U_1_df_TU_QSd_TU_buUdu^SQM_c^U_1_RQM_c^We^Q_1_RQM_c^W_1_RQM_c$ $\label{eq:local_control_control} \text{bQ; $w^$ is $LU\Gamma^Q$ QU_i aeU Ucds $U^_c$ T_c A_df_c bif QUc\%_aeU dU^TU QQ` is $LU\Gamma^Q$ buf QUc\%_aeU dU^TU QQ` is $LU\Gamma^Q$.}$ Q, QSd_TU`bWbb/SDQ%_UcU^_aeUcU`bWbb/SUb_U^ceddQffQTU^\Q_dbQficYU]RQbW_%U, Gbl8XeRR.ce`_^U/aeUU, QSd_ TU`bUNDBU^SQ Uc TUcTU U\ceU\ Q^dUbY bi \QbQ w^%U^U\] df aeU cU`bUNDBU DUb c ^S ^C\cdU^dUc UcdQc S cQc5 oDeUTU $XQRUbceU_Q^*dUb'_bU^*e^*QS_cQ^*QdQe^*Uf^U^*\underline{d} \ aeU\ cU^*\underline{U}UfQQSQR_\% \ c'^*\underline{V}] \ RQbW_\%QG \ e^*QdU^*TU^*SQQ^*dUb'_bU^*\underline{U}\underline{V}QU\underline{c}\underline{U} \ .$ UfU^d_5 GYe^QS_cQc\WeUQ_ddQ%Y^ ^^We^QdJ^TU^SQQ^dUbY_bQcec\We\U^dJ\%J\d_%SUci__TURUbQ`U^cQb] ei S\Qb_%eUc\WeU cY^^YWk^dl' TU bQ; w^Q^dUbY b` b\ aeUTURU cUWeYb

GNN_nran_are_Online_Son-chan. In long and hir /otherdinated m., "P/Onned incining" cncline of the nice of nice of nice of the nice of nice of

 $I \land QSd_TUUNUSSW^_ `BUNUSYSQUC e \land QSd_S_] `QQQMF_%U \land U \land QSdQS_^BUNUSUYSQQT_c_] sc S_cQc aeU cU S_] `QQQY% cUTUcdQSQ<math>\land$ U \land VQS_] `UxUYSQQQ\QfYcdQTU\Q] UYUU GYQ] UYUU%U \cdot\QSd_S_] `QQQMF_% BUNUSU_ aeU `QUSU YYUUY_BU\^\QSd\QQRc_\edQ] UYUUY\] _OM_GYQ_] `QQQMY\UYU\QSQ\QRC_\edQ] UYUUY\] _OM_GYQ_UYUUY\] _SeQaeYUb UYUQSW^QWe^Q : \land d_SUC%Ye^X_] RBU WUYU XQI RBU\Q_VUxUQTUT_c dY_c TUQYI UYd_c%Q\QfUj aeU cUUYSeUYUQe^Q` UXd_% Ub_WUYUe^Q` UXd_] sc \edubuUQe^_ aeU\U_\db_4i aeU^_ XQ \QSYSe^\cd\CYSQc_Uj_SY_\CTU\YYWk^dY_U\U\SQc_TUYTeS\b'

@\\#Uadot TU\Qf_\e^dot ?_^QX\Q^^: Tg\Q\$Tc

aeUt/d] U%QcUQU,e^_ U_do %c^_ aeUcU/l YQu,Q`Udd_3cYU^QUUSSW^aeUUcdR\USUU^dbuU/c%\UWW_aeUdDYU
] U^c Q`Udd_Q% cU ^UWQ^QaeU_Q_aeUdXYUU,Q`Udd_3cYU^QUUSSW^aeUUcdR\USUU^dbuU/c%\UWW_aeUdXYU
] U^c Q`Udd_Q% cU ^UWQ^QaeU_Q_aeUdXYUU,Q`Udd_] sc \eudau\eudau\eudaqqTU e^QU\USSW^XUSXQQRc_\edQ] U^dU c^\}_df_
Q^dUb\euday_\eqq \quad \

 $\begin{aligned} & \text{GYU, 6/dut/} \ _ \text{TURUT_dQbQe^LueYNRbY_S_^/QQWU^SNQ__/QQsdf^NTQTTU/Q^QuebQUJ QWTU dQ,} \ Q^UbQ\\ & \text{WeQ, cU`_^U^U^U^QRQQf} QWQQWU^SQ\\ _ Tb_Q\\ & \text{Ud} \\ & \text{MAU XQSUbaeU/QULSQQQTULSU^TUBW_aeU dQ,} \ & \text{CU^TU U^TU TU/_c `Uc_c c^C } \\ & \text{VQQ} \$

:\Gb\8XeRRce`_^U%eU\Qf_\e^qQT^_`eUTUQWdQbQd_T_cc^^QWk^]_df_4ice`_^UdQ]R%_%eeUcYXQie^]_df__`Qqqe^QS_cQ%
i ^YWe^_U^S_^ddQ%Qf_\BW^YVQ\R\U]U^dUcUc\WeUaeUU\]_df_':cd_Uc`bsSdSQ]U^dUce`_^Ube^QTU`U^TU^SQS_]`\UdQTU\Q
f_\e^qQT_cRbU_c]_df_c4cY^_VeUbQd_dQ]U^dUTU`U^TYU^dUTUU_c%eeUcUwebQ]U^dU`_TbbQQieTQbcUQcu]Yc]Qe^`_S_cY^
U_c4_QieTQbcUQcu]Yc]Qe^`_S_U^S_^dbQTUe^]_df__%Y^QQieTQTU\QVeUbjQi\\`Uc_TUe^]_df__S_^dbQY'G^UIRQbW\%
ce ce`_^U^T__aeU\Qf_\e^dQT%eQT__cUdU^UQ^dUcufQbY_c]_df__c`eUcd_c%eUTUedNYQb_cQeQYd_Z%U\UWbce`b_`YQ
Y\\eU^SQTUU_c%U\QRQ^T_^_TU_c]sc\eUbduC%c\eVX_c]scTtR\\Uc%ee`_^UaeUcUQd_dQ]U^dUYTU`U^TVAUTUA_df__c'

ce] of QcUWeY64t\]Y:] U^U cdUT Se] U^U d ce` U^U SQbQ] U^U dJaeU%5 U^U SQ Q\Q`BUXBJ/SQTU\Q] U^U DUTUe U^U of QrdUc $TUaeU_db_\&^{}_LbC_Uh]_df_TUaeUTh^{}_L^{}_AU_f(f_e^{}_AD_f^{}_B) bb_\&Qf_e^{}_AD_f^{}_Uh_CuTh^{}_L^{}_AU_f^{}_Uh_CuTh^{}_L^{}_AU_f^{}_Uh_CuTh^{}_L^{}_AU_f^{}_B) bb_w^{}_AU_f^$

aeU/Q^USUcYTQT^ `eUTUS ^c/cdb/S ^\QQWU^SYQ \Q\RUbdQT4i aeU`QbQce` ^Ub\ S ^ddQb/ %Uc XQSUbaeU\Q\RUbdQTi \Q \\RBUC% \Q] U^dU% QaeUc ^\ c U\USd c TU e^QSd aeU^ Uc ^USUcQbY' M%Y^U] RQbW %UWk^t\%Qf \\SW^U^cuUc U\ U\USd TU\Q $\hbox{cUts $`$'$ LeU SQTQ QSd $TU\RU f_e^0T Uc U^cu] $'$] QUU UVUSd $TU\Qf_\SW^CUce`_^UQRe^TQ^dU]$ U^dU`_bt'_: ^`' }$,-*%TSU3GYe^X] RbJ Uc e^QSbQxbbQS] \ XUTU] cdbQT cUb%Uc TUSY%CYcUdbYUU^t\e^` TUbTU\Q\RUbdQTTUXQSUbU\

RYU^ U,]Q% SeQaeYUUQTUU\\cuU\\ceZUdTUce`b`YQ\RUUUUSS%/%b\ aeU`TbuQ%Y\ XeRYUUQaeUbT %XQ^UUWNT i XUSX \ S ^dbQbY &6aeucUce` ^UdT \ aeUUcReU^]Q, U^U,X]RbUUcU,UVUSd TUceU,USSYW^4i` b\ aeUceReU^ $] \ Q_U \land cuUUSSW \land Uc U, UUUS\underline{d} \ TU \ ce \ \land QSUb_ \ `_bUUSSW \land \&_ \land Ucdcc \ `QQRbQc \& aeU \ `_Tb_Q \ cyXeRYUbQ \ aeUbT_ \%Q \land _ `_bU, USSW \land \&_ \land Ucdcc \ `QQRbQc \& aeUbT_ \%Q \land _ ` dQT_ \ `_bU, USSW \land \&_ \land Ucdcc \ `QQRbQc \& aeUbT_ \%Q \land _ ` dQT_ \ ` _bU, USSW \land \&_ \land Ucdcc \ `QQRbQc \& aeUbT_ \& QCc \ ` aeUbT_ \& Ae$ 5_^dbQb'';6cuaeUU^`sW,./%Qe^aeUcUQ]eibQ__^QR\U%TUaeUe^QX_]RbUcYU]`bUTURUUUWbbU,RYU^]Qi_b%bcY^U]RQbW,% t\`eUTU%cYU`\QSU%U\XZQ db] T \ aeUUc\]Y:] aeUcYXeRYUbQTY6X %t\`eUTU%cYTUSYTUUUWXb dbQS cQ'M\eUW `bc\WeU% `bu,u^du^njiyu^d%QSeQaeYubdi'`QddSe\QbTU.Reu^Q%QcuQ]Qib]u^b4`ubdWru\Q\\RubdTTU.U\UWbaetdi'TU.RYu^ $aeUcUaeYUbQ~\&GYXQ~Q/Wk^cYW^WbQT_U^\Qc~x/df~Qc~QQRbQc\%TURU~cUbUcd_\%aeU~lQf_le^dQT~Uc~lQl/RUbdQT~TU~Ul/Wbaet~dY_TU~Ul/Wbaet~dY~Ul/Wbaet~dY~Ul/Wbaet~dY$ RYU^aeU cU U\YWU`QQQUUNW64ce`_^YU^T_ aeU U, QSd_TU U,USSW^U^cu] \tag{QTUdUb} \YQTQ`_be^QU,USSW^Q^dUSUTU^dU @Q \\RUbaQTGB8XeRRXQR\QTU%ck\UcU\`TUbTUe^X]RbJ`QbQ]fUbceSeUb %8 ^VbjUQe^QSdQ^dUSUTU^dUTUU\USS\w^% `Ub `QbQecQb UZUBUb\Qc\QSe\qQTUcTUcTUceQ]Q'D b\ qQ^d%#',02'\$XQR\QTU\Qc\QSe\qQTUcTU\Q]U^dU%T\$UB:\X]RbUdU^U `TUB% Ucds U^\RUbdTTUTUcSeYTQbUcdQc VQSe\dQTUc% QxQedqYQb, cS bbUSdQ] U^dU% `QxQQRecQbTUU\, c%; aeU\U`\Q;SQ;M $\label{eq:local_to_def} $$ Uc_t = \ensuremath{ \begin{tikzpicture}(1,0) \put(0,0) \put(0$] Q^T_% \Q`b TeSS\m^TU\ c Q8d c U\UW\T c%UY\S\ec \ c] \t() c Q8d c TU U\US\m^\%\L() ei ^ \t() Q\U^`'+1,' p\`eUTU] Q^TQb cec QSSY ^Uc4i U^U\`\bUcU^dUT Se] U^d S ^cYddUU^ce \RUbbtT4aeU`eUTUTQb ^UWQbcUQcu] Yc] aeUU\`\QSUb% aeU\U `YQISQIMD',00'GYQCQSSY^UcTU\cX]RUUC&^cc^u\bTeSdTUe^QYRUUUUSSW^UUSSY^UcYUcYUcXI]RUUC

^USUCYTQT TU\Q^QdebQUj Q%&^_`eUTU cUbU^bQj w^TU_RZbd_TU bUS_]`U^cQ_SQdW_`_bce SeU^dQ A YU^dbQc aeU%Y\QQSS\w^U^ $\label{eq:local_$ ce` TUb% UcdQRQU^\RUbdQTTUXQRUbU\UMT U,S ^dbQbY%UcU, RZUd`b`Y TU'bUS]`U^cQ SQcdWY%UMX^aeUt\U,\WUQ

S_] `_baQ| Yund_aeU XQR\QTU S_] _ ceXbd_Qce U\USSW^%Lc ce `b_`YQ U\USSW^%QcuS_] _ ce S_^TeSdQ UndUb^QS_] _ S_^cUSeU^SYQ

. 1

S]`baQbacU;6aeu%U^UcdQcx\dijQc`QQRbQc%QR\QTU\Q\\RUbaQTTUU\UM\bTUQSeUbT S] \U`\QiSQ'D b\ aeUU\

TU U/_ ' M `_b/_ dQ^d_%Lc Uf YTU^dU%aeU aeYUU TUS'b^_ cwi__/Qc QSSY_^Uc UhdUb^Qc% Ub_ /_c Qsd_c TU

\$':\Gb\8XeRR.ce` ^U^USUCQXQ] U^dU aeU cUbS] `\Ux0J U^dUYS ^cYcdU^dUS ^\QQWU^SYQ4i aeU Qce` ^Ube^cUb`QxQcUbe^ QWUNDUNQaeUUc NUSUCQXQXXLcenQS ndbQTXSSWnWp %', **'iQ\ \QXW TU cec TXSebc cc RXUU,dJ QTU\Q\RUbdQT%CUce` nu% ~USUCYTQT%QSSW^i`QtW^%Q] \t]QS_cQM`_b_aeU`QtUSU.ce`_~UbaeU ^_XQ QSSW^%U^cU^dYT_UcdbSd_%Ub_\Qf_\e^dQT4i aeU $f = \frac{d}{dt} + \frac{dt}{dt} + \frac$

? ^QdKQ^: Tq QbTc @Q\YRUbaQTTU\Qf_\e^dQT

@\\rutator T∪\Qf_\e^ator ?_ ^Qt\Q^: Tg Qt\r

 $\label{eq:local_constraints} $$ UUSSW^Qcu] Y_{constraints}^* = UV_{constraints}^* = UV_{co$

+ GAVENDO, CAMONI, INCARONI, S.

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+':\`b_`Y_Gbb8XeRR#',*0'\$XQR\QTUA_df_cS_]_ U\ceU_i \Qbg\w^TU\QQSS\w^`_b\QY\\eU^S\Q\% Q\ `\buf\QUSUbY\\eU^S\Q\ aeU\cU`eUTUT\US\bS_^e^Q\SQecQ\&Y_Q\W_aeU\cU\\\e^TQ| U^d_i \bq\w^TUe^Q\ S_cQ`_bce \Y\\eU^S\Q\e^Q\Y\\eU^S\QaeU\uc\\\bSeU^\dui \U\\SQ\5

, ': cdJ Qed_b^_ cw_ XQR\QTUA_df_c S_] _ U\ ceU_ i \QtQ\ w^TU\QQSSw%_b\QY\\eU^SQ\ aeU\ \bI\QUSU\ \U_0 U\ \bLQ U\ U\ U\ U\ Ce Y\\eU^SQS_] _ \\ \text{Loru}\ \QtQ\ \\ \text{Loru}\ \\ \text{Loru}\ \QtQ\ \\ \text{Loru}\ \\ \text{Loru}

`QQRbQcc^tcdgc38_]__] dif %aeUdbnu/eWgbunu,undnmji Yund % Ucu,`b TeSd Tu/Qyndu/WWnSg%ib nusucgbr Q/QQsSYw%bc TUSYS% QQQU, UZUBSYSY_TU \Q\QSe\qQT QSdf Q%TURYT_ QaeU_c `b_VUc_tuc ^_ cU UZUBSUbQ cY^QWe^QbQ; w^6BH; F xEF 9x6DCB; F \Q] Undu Q/QQSSWn4` b\ aeU Q`QddbTU QXuaeU Q`Qduj SQ S/QdQ] Undu aeU SeQnT_enX_] Rdu cu ThSu aeU ucds Th£`eucd_QenQQSSWn] sc aeU_ddQ%Lcd_cYW^YMSQ`b_`YQ] U^dU\QYYVeU^SYQ`bUT_] YQ^dUTU aeU e^_ TU_c]_df_c dtU^U Qe^X_] RtU`QtQ\Q`b_TeSSW^]_df_UcU、ceU_i \QbQ w^TU SeQaeYUbQSSW^%_b_aeU \\]_df_aeU`bUfQUSU%TX`_^UU,QWU^dUS_^UTUUcQ\`\Uv_TUUcQ $QSSW^*_i GX_bQ%Y] = df_c TY^*_AbVQ] U^*dUQVQQSSW^*QS_A^*PQSW^*\&eUSQecQ^VQ] U^*dU^*QQCUbTY^*_eUcd_4i `QbQXQSUbaeUVQ$] U^dU`QtQUcdQbTY£`eUcd Uc SQecQbaeU cUQTY£`eUcd 4i`QtQXQSUbaeU cU Ucd: TY£`eUcd QXQSUbaeU Uc NaeUdUl4i Uc Vc \] '\[_ aeU cub\Q SQecQTU e^QSd_TU\Qf_\e^QQT' M cY^U] RQ\\\%\cdU] '\(\) _ cuv_b8QSX_ c_cd\\U^\u aeU cuQ QRcebT_\%e`_^ub]_df_`QtQcUbe^QSQecQTU\QQ\$SYw^TU\Qf_\e^dQT'McYS_]`QtQ]_cUcdQcS_cQcZe^dQc%tU^U]_cQaeuTU^eUf_e^]_^dw^ $\label{eq:locality} \text{UcVeUij} $$ $ ^\circ QSeQ_i ^ cUUZUSU% ^ `eUTU%U^Q_i QTUQ_i QTUQ_i S_cQ_%U^UVUS/eWQAii \ XQSU^UhSWQbUcd_c QSd_c TUQf_le^dQT%$ i XQSUbUcd` be^QYYkeU^SQT] YQ^dU4cu%e^QYYkeU^SQaeU`bUfQU5U`QQVQ`bTeSSM^TU\Q6dTU\Qf \e^dQT%`QQVQ `b/SYY_TU\Qf_\e^qQTUc]_fYTQ_SQecQT_QcUbUZUGYTQ`_bU\Q%_aeUdU/USeQaeYUbSQecQ\YTQTU^\Q`b_TeSSYw^TU\]Y:]_%_ SeQaeYUb\QSQecQ\TQT aeU Uc\QSQecQTU\UZUbSYSY TU\Qf \e^dQT'

 $I \wedge Q TURYTQS_ \wedge CYTUBQSYM^TUUCdQc S_cQc \ aeUU, Gbl 8 XeRR XQQfQ^*, QT_ YQc UhdbQvQc YS_ \wedge CYCdU^SYQc \ aeU ce \wedge_SYM^TU YRUbdQT \\ aeUS_ \wedge CYCdU U^ `_TUbTUfQSu_ YRBUTUdUQ_ YQSYM^TU d_T_c _c TU \Qf_\e^AQT$

?_^QdKQ^: Tg QbTc @Q\YRUbaQTTU\Qf_\e^dQT

^USUcTQT%c^YT_QaeUTYSqDT_TUcU^dYT_S_] x^%aeU^_`eUTUXQRUbe^Qf_\e^qqDTcY^t\A_dY_&\$_^TEZ_U^%eUTUcUb $\label{localization} $\operatorname{CMSU^4U} \operatorname{QQS_1U^3U^5}_{\operatorname{CML} S_1} \ \operatorname{CMU^4U^3}_{\operatorname{CMU^4U^3}} \ \operatorname{CMU^2e^SQ^2QSUbaeU^Q^SW^TU^RUbbUTS_^Q} $$$ Y`\(eU^SQTU\c] dfcTU\Qf\\S\(m^\MS] UcTU]Q^UQQUf\TU^dU`bcu]\c) \@eU^`eUTUXQRUbe^QSdTUf\e^dQT% \Q`b\NUb\'SQTU\Q] U^dU%\^Q\Wk^] _dff _ Y`SU^df_%Q\W_ aeU U^_`Y^W^TU\Q] U^dU aeU ce _RZUdf_ Uc% fQTUc`et c4`_b_ aeUUc]sc]Q^MXUcdQ%aeU^XQidQ\\RUbdQTU^U\u,e^fUbcS]Qj\YYQ^cY^YX\e^QdQ\ScQUc`c\RUb S ^SURYR\U'

GUSSYu^L≯

@QUFYTU^SQTUSYDING S_{s} SY YU^d_` hufy TU/Qc f_\/SY_^uc TUQWU^duc]_hQuc TU9Y_c'

 $EeU \setminus c QSd_c TU \setminus Qf = a TU \setminus c QW \cap dUc \setminus c \cap c \cap Qf = a TU \setminus c QW \cap dUc \setminus c \cap c \cap Qf = a TU \cap dUc \cap c \cap dUc \cap$ `Q&USU`_bSYUbd_S_^_S1]YU^d_`bUfY_TUUcdudd'_TUUfU^d_cTU9Y_c':^U,]Q^UZ_TUUcduQbYe]U^d_4{}UWecdQbQU^`b1jUb\eWQb `b_RQbaeU9Y_cdW1Ue^SYUbd_S_^_SY|YU^d_\bUYY_TU_cQ\$d_cf_\e^qQbY_cTU_cQWU^duc]_bQuc4iU^cUWe^T_\eWQb%|_cdbQb\Q S_^cUSeU^SQ%_Swj__cUcYMeUTU Qaeu%aeU_cj_\SY_^UcTU QWU^duc]__bQ\Uc^_c_^S_^dYWU^duc%TU]_T__aeU cUQ cY^ ^USUcYTQTTU S_^UhYW^i S_^cUSeU^SYQ

: ^`bij Ub\eWQb%\UTU`\b_RQbaeU9Ycdb\Ue^S_^Sij YU^d_`buiY_QRc_\ed_i QWb^QcTU\QcQ8SY_^Uc\\RbucTU_cQ\Wo^du_]_bQ\uc'

I^_`_TbuQ`U^cQbaeUU^ce_d_dQ\fTQT^_XQ5U\QxQU\ddQbU^e^Q\bMe]U^d_TUUcdUdV__\$_^s^\$eQaeYbQaeUcU`b_WbcQ^\$bbddQ^c3`Ub_dQ\RYL^ _ Uc4SYUbg_S_^Sj_YU^d_`bUfY_TU9Y_cTU_cQ&d_c\\RbUcTU\QwU^duc]_bQ\\u00dbc_CaeU`bUbYTU^SbUbaeU\Qc:cSbbbbQc $c_ \land Q \mathsf{DQQRLQTU9Y} \texttt{C4i} \ \mathsf{UC} \ \mathsf{USQ} \ \mathsf{U} \land \mathsf{$ dQ^`\U^Q] U^dUS_] _ _c \i] YdUc TU UcdU U^cQi _ TYCUVQT_c QT] YdUs 4&ee``_cYWQ] u] Y:] _ U^UcdU T_Se] U^d_dU^WQaeUfUbS_^S_] _ `_cUUb\Q fUbTQTTU\Q7YR\YQ

6bW > A Y`bij UbQbMe] U^d_cUUIZSedQbs^TUcTU/Q`bUTYSSW^TUdQUcQS_^dUSij YU^d_cTU9Y_c'6aeu] UWecdQbQ%U^\`bij Ub\eWQb%UcdQR\USUb

UcdQcTcScQcS] QhY]Qc' *' GY9 Y.c ^_ S_^_SW%_ cU`eUTU`bUUSbUcdu dY_ TU UFU^d_c4Uc TUSB%_` `eUTU`bUTUSb`UbU^d_bQi SYbdQj U^dU U_c' GY9 Y.c ^_ dtu^u] sc aeUe^Qce`_c\\$\\^Y\$\\ba\Qu^\ts\\Q\$\\^S_^Uf`U^d_c\TU\Ucdu'd\"_\\\\d\"\d\"\cU`eUTU\TU\$\Q\$\Q\$^_] sc aeUe^Qce`_c\\$\\\

YSXIbaQ D_cYdfQ| U^dUTU`bUTUSYXIbc`b_YbcQbS_^_SUbTUQ^dU] Q^_%_ TUS\QbQbDbUcSYV^SYQ`_cYdf_'

GY9Y_c ^_ TETQ` bUS_^_SUb_c \\edge{c} | _\\SY_^Uc TU Q\W^duc] _ \bQ\Uc\\w^d_\SUb SYUbQ] U^dU ^_ \Qc `eUTU S_^_SUbTU $Q^*UJ = Q^* U + Q^*U + Q^*U$ $S_{_}S_{1} \text{ YU'}\underline{d} \text{ TU}_Q\text{Uh}\text{Yc}d\text{U'}SQ\text{TU}_Q\text{aeU}\text{TU}^{\prime}\text{U'}\text{TU}\text{TU}\text{X}, \\ S_{_}S_{1} \text{ YU'}\underline{d} \text{ TU}_Q\text{Uh}\text{Yc}d\text{U'}SQ\text{TU}_Q\text{dQ4}; U_{\text{A}}\text{aeU}^{\prime}\underline{\ \ } \text{`eU}\text{TU}\text{Uc}d\text{Qb}] \text{ sc}$ cUWeb aeUU, do'

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D_bl_ dQ*d_%ses^d_c%set_WQ*TUi set_dQ*Uhdu*cQc_Ufub\Qc_S_*cUseU*SQc_TU\Qc_f_\%Y_*Uc_TU\QW\duc_]_bQu\cdot \end{array} ecolor \end{array} to cost \end{array} \text{array} to cost \end{array} \text{array} \end{array} \text{array} \tex

: cdQc` cYSY ^Uc c ^dQuc S] %ce` ^W %YYWe^ ^UWQbs^%QX bQ`b SUT Q RcUbf Qb\Qc cYWeYU^dUc S cQc' S ^TeSdQi SeQ\TQTUc] bQ\uc*']QcSe\Y^ \%ecfYbdeTUcicecfYbYc\%e]Q\TQTiTUReU^Qc\bsSdbQc\%, aeUbUgQbTQR\Ui\e^YR\Uc% Q] U^eT XQ^cYT `BUTSX ` b/QS ^TeSdQ] bQ\TU9Yc'&\QxQx/YQ\ ^UWQxcUQ RUTUSUb/Q bTU^TU9Yc%U^TUZQbYbQ ce WU^dU%éU`bUT6X_'9Y_c\UT6UQA_Yctc3: h'**2':cdicUWbb_TUaeUU\bUiTU: \\%'d_^_cTUZQbs\b';6aeu9Y_c `b\UcQ^ cw\ `QtQQTfYYQt%cY^ S ^SUb\QTUcRUTYU^SYQ\edebTU\VQtQv/^:^U\SQ`!f\Y-'9YcTY5U%`Ub;QtQv/^^ c Ybs4i ` ^Tlbt]Y]Q^ c RbU:Wird%1 S'MSQ`'Yh',)'A YttcTYSUQ,VQbQw^3:^SeQ^d Qd%1 deccYUbf c%tt aeUQcu ^\dU]UbQ,GUvB;jUbdQ]RYt^SQ`hYY2'&@QS ^TeSdQ]bQ,TU?cuQc%bce^]RbU%U^ceSU\UZUbSYU^TQcu] Yc] 'QuQ' 'Autocu Q/QYT /QubuQ%U^`QubuEy(Qb) c QSd c%AeU`buTrSX' bu^Sy] QTU dbucSYU^d c Qv c Q^duc Tu ce ^Q\$\] YU^d %\ \Q`b \USuQcU\\QTQ`_be^] \\Q\\b %\ bU^fQT_i S_^\Xb] QT_`_b\Qc`QQRbQcTU e^cU\\&^T_`b \UdQ%6_]__ aeU cUMebQ] U^dU ^ TUZQbuQ %#* F Ui Uc h\\TU* &/ % +'\$: cdQ` b \USuQ\\eU dQ] R\t`~\\U\USd \\e^Q` b\U\SSW^TU\\Q S ^TeSdQ] bQ\TU\Qc`Ubc ^Qc%U^\QTU\U^cQTU\ceSt(] sdbQi U\Se\d YT \sdb(S XQcdQUcU]] U^d % \QYT \QdbQTU\ c cQSUbT dUc TU/ c/eWQSUc Qd c %aeUcU`bUn'SU? cuQc TURU V\$USUbc RbU QaeU, QdQbTU7UdU,' A YaeUQc`bUn'YE \Q S ^TeSdQ.d ^dQi `USQJ Y^ c TU.6SQR%Q, ^UWQbcU.Q.UcSeSXQb/Q`QQRbQ.TU,GUV b` bt.\% U,\WWD^T RYU^U,`bUcdQb QUU^SYM^Q\ c \Qc c`b \UdQc%U^\bQFQ] _dTU <Q\QQT Q\QbeYQ\# hhYTU\FUI' +) &+++'\$cU`LUT\Z \QS_^TeSdQ] _bQ\TU =Q; QU/%J^U, aeU \Q SbeU,TQT aeU TURU cUbSe\`QR\U TU4U^U, aeU =Q; QU, TYSU%oaet Uc de cYUf %Jcdu`Ubb % QtQ aeU \cX2cTU>sbQu3dUfUbscTQcXcecX2c%bQcWQbQcec]eZUbUcU^SYdQ;@QS^TeSdQ]bQ,TU8ibecUcds`bUTSX%] eSX_Q^ducTUaeUdefYubQe^cub%u^ce] YcUb6_bTYQQ,`eUR_TU9Yc%_aeUcUbuMbbUQ,fUbTQTUb_9Yc%u^\Q dtQ^cVtj QSW^TU\QSQedfYTQTTU\c?eTYc%\Q`b] SW^TU\QS ^cdteSSW^TU\dU]`\ ##e'L@\'+1'i@t]'*,' S]`QbQb+8b^'LLLJ≯++%+,'i:cTbQcY*&-'\$o8es^dcSQccTU\QS^TeSqQ] bQ,TU\cbuiUcTU\B bdUiTU\Geb% _c SQc_c `Qbbbse\Qbuc TU\QS_^TeSdQY^\$eQTU_c buli uc TU G'bbQi : WYd_%cU` buT\Z U^U, SQ`ub_** TU 9Q^YU, Ge S bbe`SYW^%QfY\U^SYQ%U\b R %QdbQfSW^i \Q] U^dbQ Mc RbJdT %Ses^d cU`bJTYZ \Q] Q,TQTX bbR\UTU6^duS :`u\p^Uc%\Q|QT_Q\u_e^Q`Ubc_^Qf\%U^\eWpbTU:`YX_^U%_\(\ext{\gents}\) de\,% dD|R\f^U^U\U\SQ`'

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#' A eSX_c Q5_^dL51} YL^d_c XQ^cYT_ `bJN5X_ `_b9Y_c%eUTU'U^TU^TU\PTU\PTU\Q5_^TeSdQ] _bQ,TU\Qc `Uto_^Qc `Qad5e\QtUc% cU\\UfQb_^Q5QR_%Q cUQ`_bcec QSSY_^Uc f Yab_cQc_ f \SY_cQc' D_b_ dQ^d_%_c X\Zc TU \sbQ\u\TU \bQ; \Wf d_ `QbQ] _bbQ\\g\%c\\ 1\TV_Q Q6 \RbQ\Q] \%#\c\hf \\$\%E eU \eU `b_f_SQTQ`_b\Q] QTQTTU?_ct'=Utj Q^_cU^\QfU^dQTUt\%\Q\j\`YUTQTTU\QQ] Q^dUTU?_ct% ce`b_`X\cuvQ,TUfYtabTU^bUcYdtbce du^dpsw^ @_bu^y_csw^tu/Qs cq`buwwebqtQu^u,ceUv Tu? ct%Tu u^tuqTu/Q] \t] Qs ^tesdq] bq/ @) \qbs \Qtu? d0] i \Q`b \Vbu/%th ZEUSUC'*. &+)'\$CU_W6w`_b\QS_^TeSqQTU_c]QfQT_c6RY]U\USi_cX_]R6ucTU\GYAeU]'@Cc`b_WUSQc\$_^dqQ\QSQcQTU:\\%# GQ]SXQ`\Yi `````; eUb_^BUQ}`QT_c`_b\Q]`QTQTTU9_UWU\UT_] YdQ%U^QSecQb_ccQSUbT_dUc4i \QVMQ^\J``YUTQT% \QUhdbU] QSbeU\TQTTUGQx\U^\Q $TUcdteSSW^TU \ c QSUbT_dUc \ U^B_R \# GQ] \ 'hh\mathre{M}^* \otimes Q^* \ 'b \ WCSUQ \ TU B \ Qdc ^5_dtQ 9 \ Q' \ 'ff \ \# GQ] \ 'h\mathre{M}^* * \% + $VeU Se] \ '\mathre{M}^* \ 'b \ (Q) \ QTQT \ X_bbR\U Sell \ '\mathre{M}^* \ 'b \ (Q) \ QTQT \ X_bbR\U Sell \ '\mathre{M}^* \ 'b \ (Q) \ QTQT \ X_bbR\U Sell \ '\mathre{M}^* \ 'b \ (Q) \ QTQT \ X_bbR\U Sell \ '\mathre{M}^* \ 'b \ (Q) \ QTQT \ X_bbR\U Sell \ '\mathre{M}^* \ 'b \ (Q) \ QTQT \ X_bbR\U Sell \ '\mathre{M}^* \ 'b \ (Q) \ QTQT \ X_bbR\U Sell \ '\mathre{M}^* \ '\mathre{M}^* \ (Q) \ (Q)$ $6RcQw^{Q}_{L} URUQtcUS_^{d}Q ce \ QTUV_{RecSQ^{T}_ce} f YTQ%] \ U^{d}bS_^{cec} S_^{SeRY^{Q}_{L}} Q^{d}U \ c \ \underline{Z} c \ TU, c \ \underline{V} \ @Q \ b_VUS_{QSQ_{L}} w^{\#} F U U U C \ \underline{Z} c \ TU, c \ \underline{V} \ QQ \ b_VUS_{QSQ_{L}} w^{\#} F U U U C \ \underline{V} \ QQ \ \underline{V} \ \underline{V$ $\text{hY} ** \& *, '$ \text{VeUSe} ' \ 'T '_b \text{QEURU} `m T '_b \text{QEURU} `m T ' 2 \text{deQ} #* 8 b_ \text{h} 'M' . 'W 2 \text{deQ} 'S 'M' 'MeU CU XQR (QS_1 _ TU ce_1 _ QTQT 'MQ ' b_ \ W 5 \text{QQ} \ b_ \ W 5$ JUbS_]`QbQb''\$\Q\Q|`YYQTU?Ub_R_Q| #FUiUc.hYf'\$\\eUSe]`\YT_`_b\QS_^c`YbQSYV^%bQSYV^i QcUcYQd_cSbeUUcTU7QccXQ%#FUiUc*.%0! $S' \otimes_{\mathbb{C}} \mathbb{E}_{\mathbb{C}} \mathbb{E}$ NNj bt/# FUI Uc Inf Y2 & *, %+) '\$#+GQ] ' L Yf ** %+ '\$cU Se] `\W\`_b\Q] Q,TQT X_bbr\U 6 RcQw^%Q, bLRUQbcU S_^dbQce `QTfbU%L^ RecSQTU ce f YTQ%] U^dbS_^cec S_^SeRY^Qc Q^dU_c _Zc TU\ c_\' @Q` b_VL5uQS_^dbQ GQ_] w^# F UI Uc hY** &*, '\$\eUSe] `\\T_ `_b\Q\bURU\Yw^TU?Ub_R_Q] i $eceb^{\circ}Q5W^{\circ}(aeUcUXQRQS_{1}^{\circ}) = TUce^{\circ}QTQT^{\circ}Q^{\circ}b^{\circ}USQU^{\circ}S_{1}^{\circ}USQU^{\circ}S_{2}^{\circ}USQU^{\circ}S_{3}^{\circ}USQU^{\circ}S_{4}^{\circ}USQU^{\circ}$ Se] \\T ` b\QS ^c\Y6Q\$W^\stq\\$\W1 ; QcUcYQd c SbeU\Uc TU 7 QccXQ\\#FU Uc *, \%0 ! S'\$ @Qc\\UTD\\b \V6Q\\$\V6Q\$\\\T \U\\b \V6Q\\$\V6Q\\$\\UTD\\b \V6Q\\$\V6 Se] $\w\ b\Q]$ QTQT X $\b\R\Q$ BURUQ \c US $\d\c$ USQC $\d\c$ USQC

, - '\$DUb_ aeU TURU^S_] `_bdQbcU_c TU] sc S_^e^QS_^cdQ^SYQi V_bdQUj QW_bY_cQ%J^_`_c'SYw^Qt \%# Ub , +'\$MaeU QWe^_c X_] Rbuc ReU^_c TURU^SQUbi Qtbu' U^3bcU%#Ub , . \$%8 btcd_`bUT\Z_U\` USQT_ TU DUT\b_%Q\ ^UWQbce GUv_b%_^ccc SYbse^cdQ^SYQc%TU] Q^UbQ` UbU^d_bQ M Qcu%U\ WbQ^` USQT_ TU?eTQc%Q\ dbQSY_^QbQce] QUcdb_% ce SQcdW_dubbR\Ui UbUb^_ U^\Y\Y\bUb^_%\equiv Ub\Y\Lc_db_C Uf Q^WU\YcdC'

@\\%Uadī TU\Qf_\e^dī ?_^QXQ^: Tg\Q5Tc

@\\rutator T∪\Qrf_\e^^tor ?__^QX\Q^^: Tg\Q\$Tc

$$\begin{split} & \leq \text{TeSdQTU}_c \text{ SQTU}_c \text{ } \setminus \text{c } \text{?eTY}_c \text{ } \text{XQRuQcYT}_S_^SYT_TUQ^dU] \text{ } Q^-' \text{ } M\text{\ensuremath{\text{eUN}}} \text{ } \text{cU`\testburnews} \text{\ensuremath{\text{got}}} \text{\ensuremath{got}} \text{\ensuremath{\text{got}}} \text{\ensuremath{got}} \text{\ensuremath{g$$

@_RcdrQswrTuNrdrQTU_c?eTY_c aeUXQRuQraeUTQT_Ur\QdUbbQTU *ebQU%Urce YT_\QduQi U\busXQj_TU\9Y_c
fUbTQTUb_%eU`bursx_`_bt\% \Q`bursswrs_r\di ws_rzebQi Urd_%#Ub L@b' +/ %+0'\$M9Y_c\UT\SUQ\QWUrdu%#e'
L@ >>>, % &1''\$aeUXQRuQ`bursX_ QaeU\\Qc S_cQc aeUTURUrcubs_rcuseUrsQTU ce dbQswri \Q_RcdrQswr%_baeU
cQRuQaeUUcdqbq0r_RcdrQTQ4i aeUXQRuQTUS\QbQT_Ucdqc S_cQc TUQrdu] Qr_%_bce S_rf\sswrTU aeUt\UdqU\xr\s_
9Y_c fUbTQTUb_% S' @QTUcdbesswrTU7QR\Y_rQx\s_r\ 20\s_r\ 1 esXQc TU\Qc S\sercaqr\sqc TU\Q] \cdot\sqc 1 \cdot\sqc 2\sqc 2\sqc 1 \cdot\sqc 2\sqc 2\s

 $\label{thm:linear} $$ hf' *-'&@Y']_bQXTQT TU VQ aeU U, `eUR_TU 7 QRX_^QX_U^`QX_U^`QddSeVQbcec `bu'SY Uc i WbQ^TUc X_] RbUc%UbQ^Se\'QRVUc%UcQ \\ [Y]_Q^SXU aeU VQ S\'eTQT VeU TUcddeYTQ%ce TUVUYS^T_cU i VQU] RbQWeUj U^U, RQ^aeUdU TU 7 UcQcQbYT_\sdbtS_%eU `bUTSX_% ?Ub \Y', 2% 0'$$

hhY-+'6Sd_c > '**'] QcS_dQc' YY-%0'\$

 $8 \ bbcd_{1} \ b)_{1} \ bbcd_{2} \ cc_{2} \ bbcd_{3} \ cc_{4} \ bcd_{4} \ cc_{4} \$

@\\#Uadot TU\Qf_\e^dot ?__^QX\Q^^: Tg\Q\$Tc

8_]_cU`bUTZ_U^U\6^dMe_HUcdQ]U^d_iU\BeUf_aeU_c?eTY_cTURU^bUSXQ;QbQ\AUcuQc%_b_aeUcU`bUTZ_aeU_c
WU^dMuc\UTURU^bUSRY5% QcucUbQT]Ydf_cQ_c`bfYMWY_cTU\`eUR_TU9Y_c4U^\eWQbUcTU]QcYQT_c`QbQcUb]U^SY_^QT_cU^
`QddSe\QbQX_bQ;GU`bUTZ_U^U\6^dMe_HUcdQ]U^d_%aeU_c?eTY_cTURU^U^fYTQbQ_cWU^dMucU^bucdQSeU^dQ4#9UedLLL≯
+*'S]`QbQS%^S^F]'L'

*2'\$8 bcd_] Y:]_ `butte_Q] U^et_%eeU_c WU^dtUc QRbQ; Qb\QfUbttQtUbQbU\WW^% cUS_^fYdbdU^U^cec cUWeYt_buci \Qc
`Ubc_^Qc4#A Qdbf \m**) \%*\% + hhY-* &''-, 'i hh\mathbb{T} & *)' @sQc h\m*+1' h\mathbb{f} */ &''' + 'i hh */'?_X^h */'\$HQ! RYL^` butte_\Q
Zety_c U^f \mathbb{T}\Q\tu\CcQSy_^\uc U^\ucdQ_SQc\w^4#'' A Qdbhh*+&*/' @sQc LJ +/ \waxqcdQU\\W^Q\s`butte_\@eUturU^S_^\dreQb
U^\ucdQ_`_c\S\w^i \QU^f\TD\\% TURU^] Q^\waxbd\ucd\bu\V\\Qc `UbcUSeSy_^\uc SbeU\Uc TU cec cUWe\text_buc\\Qce TucdbeSS\w^S_] `\udq\
#A Qdbhh\mathbb{T}, &' - +' /' LL >= LL >=>, - &, 2 @sQc h\mathbb{T} - 2 & *'\$@Q_Rcdr\QS\w^TU_c ?ety_c dQ] R\mathbb{T}\cdot cU`\butte_\text{Y}\mathbb{E}\cdot \mathbb{E}\cdot \mathbb{T}\under\text{Y}\mathbb{E}\cdot \mathbb{T}\under\text{Y}\mathbb{E}\cdot \mathbb{E}\cdot \mathbb{T}\under\text{Y}\mathbb{E}\cdot \mathbb{E}\cdot \mathbb{T}\under\text{Y}\under\text{U}\cdot \mathbb{E}\cdot \math

@c`UticUSeSY_^Uc%aeUU\Q`wcd_\DQR_ VeUtUe^YticUS_^U^U\] e^T_%eUb_^`tUTYSX_c4#=USX_cYh'

*/'hh'+, % LL>**'\$:\Q`wcd_\TYSUQ_cUVUcY_c8btcdQ^_%#=USX_chh+2%)'\$ M_ ct aeUTUc`etcTU] Y`QtdFQcU_R_c

tQ`QSUcU^dtQs^U^] UTY_TUf_c_db_caeU^_`UtiT_^Qs^Q\tURQv_'4MTUf_c_db_c] Yc]_ccU\UfQYdQs^X_] RtUcaeUXQR\U^

S_cQc`UtfUtiQc_`QtQQtdQcdtQbQ_cTYcSu`e_cdtQcU_c:\Q`wcd_\TYSU%cQR\QUcd_3`Ub_t\^__cQR\Q%xY9Y_c^__cQR\Q\Qc
QSSY_^Uc VedebQcTU_cQWU^duc]_bQ\uc'

-'6] U^c aeU9Yc S__SUTUQrdJ] Q^_\c Vedeb_c Qsd_c TUQWVrduc]_bQuc%dTQc \b_Wsuqc aeUdVrJ]_c U^Q: cSbdebQ buc` Usd_Q\QWxq^Q`_cdcuQQrdsbcdQrQ4Qe] Urd_%burur{ QQc SeQ\TQTUc% \c XUSX_c TU U, X_] RbuTU`UsQT_i% cec Ycde] Urd_ci QTXUburduc4\QUhdurcrwri \QbwQS_rdreQswrTUceT_] YY_%e YWeUrSQUr\Qc] UrducTU_c `b_wsrYuci _db_c%Q_c S_bb_] `Ur% QUZQb_c Q\QT_\QbuQ% _db_c frsYc VQxQ4cec WxQrTuci SbeUUc `UbcUseSY_ruc4U,S_] `_bxQ1 Yurd_TU_c cQrd_c RQZ Ucdb_Wqrtuc durdgsY_ruc% S'!'T_'9\W_\QQ] Ur_c aeUcU`buft \Qc J_\YSY_ruc TUQWVrduc] _bquc%d_TQc Ucdb_c b_wsxqc cU `b_resqcrcu` burexQc'

@\\RUbdoTTU\Qf_\e^doT ?_^Q\$KQ^^: Tg QbTc

] ei `QtabSeVQtAi VQ] Qi_buQTUUV_c tu`YbUuSeU^dU] U^dU%5_^] eSXQt SQtqSdUbucdSQt `bUSYtQt:%TUcSbY SY_^Uc i V}] YdQSY_^Uc TU VQt SeQXTQTUC%5_^TeSdqt:%YkeU^SQ%UVUSd_c%UhdU^cYw^%TebQSW/% Ubu_T_c%SYSe^cdQ^SQt x\di] QSeUcd\w% S' _ aeU cUbuQ dUTY_c_] U^SY_^QbU^` QtabSeVQt Mce`_^UbaeU d_T_ Ucd_ cU`bUT\SU^`_b9Y_c%r^^^Wk^S_^_S}] YU^d_ SYUbd_ TU\Vedeb_ S_] `_bdQ] YU^d_] _btQ, TU_c QWU^dUc \YbUUc%cUbuQU\,] Qi_bWbQT_ QRcebT_'

. '6] U^c aeU9Yc `bU5_^SUb_c \edeb_c QSd_c TU\Qcf_\e^00TUc TU_c X_] RbUc% ce S_] `_bo0] Yu^d_ TU QWU^duc] _bQuc%d_TQc UCQC WKQ^TUC S_CQC aeU cU`kUT%Zbb_^dQ^d_U^U,6^dXMe_ HUCdQ] U^d_i U,BeUF_%J^] QUbQTUYCdQQSW^%LcdQR\USAJ YU^d_% U, QSQ^SU e^YUdQ, TU, dU^_ TU, A UcuQc %U`dUTZ i dUS_] `b] UdW/} YUdDQc aeU 9 Y c UcdQRQ U^\QYW_dQ^SQCYQWe^QTU UcdQc $Uhdub^{\circ}Qc\% \ Ub \ Ucds \ TU^{\circ}b \ TU \setminus c \times \] \ Rblc\% \ S \ ^{\circ}CdU \ U^{\circ} \ U, T \] \ YY \ TU \setminus Qf \ Ybbe T \ U^{\circ}cec \ S \ bQ \ ^{\circ}Uc\% \ V_{e}^{\circ}CdS \ Q\% \ Q_{e}^{\circ}W \ Q_{e$: c`ubde GQ^d_4i U^UcdQ: S_cQ: aeU cU] Q^WUcdQ U^\Q`bsSdSQ% QbQ QQRQ^j Qi W_bQTU 9Y_c' : \A UcuQ: fY_ `QbQ cQf QbQ_c X_] RIGUCTU cec`USQT_c%\NRIQQL_cTU cec U^U] \W_cUc`\XXdeQUc4`QtQ aeU\Uc\YfQU^ZecdtSqQi cQ^dtTQT TU\Q^dUTUt\3XQTQT_Qcu _RbQc';M`_b_ dQ^d_%ce t hYd_S_^cYcdJ U^\Q_RdU^SYw^TU_c S_bQ_^Uc TU_c X_] RbUc Q\QfYaatTV_c e`eUcdQQ`Uac_^Qc TYC'eUcdQcTU9YcU^U,TuQTUce` TUb'GeS ^aeYcdQTUcecU^U] WWcS ^cYcdUU^cefY6dbQc RbU\QS bbe`SW^i\ cfY6YcTU _c X_] Rbuc' M dQ, f16d_b10% e^T_] YY_TU UcdU dY_ Uc Q] U^eT_ `buT18Ub_^Uh`bucQ] U^duBaeU ce buY_ cUbs \\U^Qb\Q d\UbbQ4aeU $\underline{d} T_c \cdot \underline{c} \cdot \underline{eUR} \cdot \underline{c\%QSY} \cdot \underline{UcWeQc} \cdot \underline$ 8 bbcd_% \QdbbbQcUQ\\U^QTU\S_^_Si] YU^d_TU\GUV_b#QfUbTQTUbQfYbbET i \QbU\YWW^\$\$_] _ \Q: QWeQc SeRbU^_c] Qbu<4aeU\\c \Liuc TU 9 Y c TURU cub`eucd U^\Qc U^dtQvQc TU\ c X] Rbuc% LucSbtQ U^cec S tQ _^uc4i aeU U\`euR\ TU 9 Y c TURU cubd T \ Zecd_% S'!T_'

Md_TQt_VQt_`bUTYSSY_^Ut_TU8_bbtd_i cec Q` wcd_VLt%Q_c WrUt_cYj_ YQbUt_%TURU^_cUbcY^_U, S_^_SYj_ YU^d_3S_]__VQt_TU^eUt_db_
GQf_QT_bS_] `QtQbU, bUY__TU9Y_c Qe^_WbQ^_TU]__cdg_Q%6_^e^_SbUSYj_YU^d_] ei WbQ^TU%TU*TU*e^` UaeUv__S_] YU^j__4i
S_^\Q\Uf_QTebQ%6U Ut_S_^TYWU^dbut_] UTYTQt_TU XQbYQ%Qt_daeU Vbbj_U^dwU, d_T_% S'&M\Qt_`b_WbsQt_U^\Qt_U' uc_d_\Qt_
bUQbf_Qt_Q Q\Q bUt_dqebQ\$W^TU\Q^Q\$W^_ZeTuQQ\Qf_UBTQTUbQYM\Ut_QTTU9Y_c% \\Uf_QTT__U^\Q`\\UY_QT__U^\Q`\\UY_dET_TU__c WU^d\Ut_4i \Qt_
`b_WbsQt_U' d_TQ\QbUf_UQ\$W^S_^S_UbYU^UQ_W_bY_c_SQj_RY_U^\U, Ut_dd_T_]__bQ,TU\] e^T__TU\QXe] Q^YTQT%Qt\tdUT__Q\Q
TUcde\$S\$W^TU\6^dBbtd_%_c bUY_c TU\] e^T__%_^Ybbt_^T__cUU^_c bUY_c bUY_c TU^*eUt_db_GUV_bi

@\\#Uadot TU\Qf_\e^dot ?_^QX\Q^^: Tg\Q\$Tc

8_b_VQb_'*'9UQxuaeUVQWbQ^`b_] UcQi æbQl U^d_TU9Y_c Q6RbQxQl %eQQ5i ?Q5_R%bQ*d_SUURbQT_U^VQ: cSbbebQ%bQ*d_U^UV 6^bMe_HUcdQl U^d_i U, BeUf_%bc TU5h%aeUU^ce c'l] Yu^dud_TQc VQc ^Q5Y_*Uc i VQl YfQc TUVQbUbbQTURU^cubRU^TYdQkTURU XQ5UbcUU^VQc YSUbbTe] Rbuc%y9Y_c ^_TeTQ`bu5_^_Sub_c f_\fSY_*Uc TUQWbv3uc]_bQbcu', DQbQU, Se] `\f\] Yu^d_TU\ucd\bar{b}_1 UcQ \$_\capsilon_\cap

+) '

8_b_Qby_'+9UQxudQ|Rxt^\QtusU%aeU\Q`bi|UxQ`b_]UxQTU\UfQ*WuY_aeUZQ|sc cUXQQXuSX_Q\QXe]Q^*TQT%U\QWQ\`burStw^TU\QcQfQ\$w^TU\AUcuQci ce f*8d_bQc_RbuGQdQ*sc%vUsXQQ^eUcdb_c`bi|Ub_c`QTbuc%##\WU*UxQ\'*.'\$cY^_XQQ\$UbaQ\'bucStw^SQTU\QcQfQ\$w^TU\AUcuQci ce f*8d_bQc_RbuGQdQ*sc%vUsXQQ^eUcdb_c`bi|Ub_c`QTbuc%##\WU*UxQ\'*.'\$cY^_XQQ\$UbaQ\'bucStw^SQTU\Qcq*df*QT\UQfYbdeTi\QcQ*df*QT]scaeUU\f*6Y_iU\]Q%b\SeQ\GQdQ*sc
S_^cYcduU^\QTU_cX_]RbucTUcUbcQfQT_TU\`USQT_%U^\QfYbd_bQTU\QfYbdeTi\QcQ*df*QT]scaeUU\f*6Y_iU\]Q%b\SeQ\GQdQ*sc
`_bcecdu^dQSY_*CucXQYbb_TeSff_%U^ce\bur_S_^cYcdu

D bUZU]`\ %QU^ddQTQU^\QUh'xdU^SQTUUccX] RBUc`QbdSe\QUuc%eUXQ^cYT\cWtQ^TUcS^ae'xdQT BucTU,]e^T%eU%RQZ9Yc%XQ^ dU^T_ \Q`QadU`b^SY`Q\TU\d_T_\U\S_^cUSeU^dU\tcd?T_TU\] e^T_%U^d_TQc \V;c UTQTUc`_ca&dQ\tc S_] _ BQReS_T_^c_b\% \uZQ^Tb_% D_] `U_%e\Y_8tcQb% S'cY^TeTQ%TU'U*TQTU] eSX_c] _^Ut TUQSd_cTU\Qf_\e^QDT%\\^cec `QTb\\' MdQ.fU| \Q] Qi_b\QTU\\cd_c ___\%Y_^uc_TU__Y__\\C_TU___\\SY_^uc_TU__\\SY_^uc_TU__\\SY_^uc_TU__\\SY_^uc_TU__\SY__\C_TU_\Q]_\%_\SY_\U__C_TU_\Q]_\%_\SY_\U__C_TU_\Q]_\%_\SY_\U__C_TU_\Q]_\%_\SY_\U__C_TU_\Q]_\%_\SY_\U__C_TU_\Q]_\%_\SY_\U__C_TU_\Q]_\%_\SY_\U__C_TU_\Q]_\%_\SY_\U__C_TU_\Q__\SY_\U__C_TU_\Q]_\%_\SY_\U__C_TU_\Q__\SY_\U__\SY_\U__C_TU_\Q__\SY_\U__C_TU_\Q__\SY_\U__C_TU_\Q__\SY_\U__C_TU_\Q__\SY_\U__C_TU_\Q__\SY_\U__C_TU_\Q__\SY_\U__C_TU_\Q__\SY_\U__\SY_\U__C_TU_\Q__\SY_\U__\SY_\U__C_TU_\Q__\SY_\U_]_df_TU,UfU^d_%U]e\d^\\\$Q^S]__\Qc_bQ]Qc_TUe^bu_%\QcaQaeU\\U\WQ^Q,\Yr%%QaeU_UbQ^\Qe^^x]Ub_Y\Yr\d:cd_^`\Qbu\$UU\dQv_ `QtQSeQaeYUbQaeUQcuS_^cYTUbQUU,Qce^d_4cYbUS_bTQ]_c_aeU^_cTYSU^_c Wkw_V_cTU/QcY^e] UbQR\Uc] e\ddeTUcTU QaeU\QcS_cQcaeU c_^\ c Db/SY 'Q% \Q\b\c'xd\U^SQ\f\xd\U%\\^Se\cdw^TU\Q\WU^Ub\QS\w^4\Q\Q^*\j\ Q\Se\Q\U^A \QcSe\ GUJ \Y'U%\\ c wfe\ c U^\U, xdub \TU\Q\XUJ\ RbQ4\Q \fi `buwqsw^_ Q^{\fi} QT_bTUe^_ TUU_c QT\bub\sqTUd_T_c _c TU] sc\fu\RU^TU\U\U\U\U\U\U\U\G\S_c\Qc\Y\C\U\] \\ \cent{2}\U\Q\T_c \S_^\U\ $\text{dU}_i \succeq_i \text{Vc. SYS6e}_{\text{C}}_{\text$ $\text{ceSUc_c4/QSeQ,TURUTU'U'TUBWYVYYQC_] QYUBQ:M^$bV^e^SQDQV_c QSd_c TU cef_le^dQT4V_c SeQUc c_^_SQC_Y QT_c `_bY^e] UbQR\Uc S_cQc_leqUc f_leq^dQT4V_c SeQUc c_^_SQC_Y QT_c `_bY^e] UbQR\Uc S_cQc_leqUc f_leq^dQT4V_c SeQUc c_^_SQC_Y QT_c `_bY^e] UbQR\Uc S_cQc_leqUc f_leq^dQT4V_c SeQUc c_^_SQC_Y QT_c C__bY^eQT_c C___bY^eQT_c C__bY^eQT_c C___bY^eQT_c C____bY^eQT_C C____bY$ $aeU ceSUTU^*U^*U ddQ^*cSebc_TU cec f YTQc%U^*Q aeU ce `b_`Y_S_] `_bdQ] YU^*d_! U, TU ce f USY_TURU dU^*Ube ^\QT_%e^^x] Ub_YYY^*d_TU$ \(\text{Li} \) Qc' MQ] UTNTQaeU\Qcf_\\SY_^ucTU_cTU] scTURUXQRUb] eSXQc] Q^\u00facTU\aeU\cu\ddduU^\QS_^SU\SW^i U\^\QSI \\U^\dl $\label{eq:wave_section} $$W\Omega^TUC LUI'_eS'_UC aeUULQ^QC_SQC'_UC TUYTU U^TUQ 8_]__%_bUZU] `_%SeQ^T___C S_^c` `YLQT_LUC U^ DULCY%_^dQQ_c] QW_C%LCdQQQ^$ $S_{\text{ce}} Q^{\text{T}}_{\text{c}} = Q^{\text{C}}_{\text{c}} Q^{\text{T}}_{\text{c}} - Q^{\text{C}}_{\text{c}} Q^{\text{T}}_{\text{c}} - Q^{\text{C}}_{\text{c}} Q^{\text{T}}_{\text{c}} - Q^{\text{C}}_{\text{c}} - Q^{\text{$ $SeQ^T_cUble^*wQc^*We^*U^*U]QvQ^Qy^*URUbQcUblu' + 6X_bQ^*e^QS_cQaeUf^*U^UQQ]U^*Ub^*_TbQTUU^*TubTUY^*e]UbQRUcYSTUY^dL^*Ub^*_cQaeUf^*U^UQQ]U^*Ub^*_TbQTUU^*Ub^*Ub^*_UbURUcYSTUY^dL^*Ub^*_LcQaeUf^*U^UQQ]U^*Ub^*_LbQTUU^*Ub^*_LbQTUU^*Ub^*_LbQTUU^*CaeUf^*_LcQaeUf^*U^UQQ]U^*Ub^*_LbQTUU^*Ub^*_LbQTUU$ $aeU \setminus Qc f_NSY_Uc TU \setminus QXe Q^TQT XQRUQ^cT QVLSdQTQc' G^C U RQSW_96_] _ S_CLSeU^SQTU UcdU QSSTU^dU^9Q Qx_XXZ_TU = YcdQc` Uc%4U UU i ' SQTU UcdU QSSTU^dU^9Q Qx_XXZ_TU = YcdQc` Uc%4U UU i ' SQTU UcdU QSSTU^dU^9Q Qx_XXZ_TU = YcdQc` Uc%4U UU i ' SQTU UcdU QSSTU^dU^9Q Qx_XXZ_TU = YcdQc` Uc%4U UU i ' SQTU UcdU QSSTU^dU^9Q Qx_XXZ_TU = YcdQc` Uc%4U UU i ' SQTU UcdU QSSTU^dU^9Q Qx_XXZ_TU = YcdQc` Uc%4U UU i ' SQTU UcdU QSSTU^dU^9Q Qx_XX_Z_TU = YcdQc` Uc%4U UCdU QSSTU^d UCdu QSSTU$ $\label{eq:market} $$ McYUdd ^ XeRVDQcYT_% b_RQRUJ U^dU%ee ceSUc_b^ XQRbQcYT_VQ] $$ d_TQc_VQc SYSe^cdQ^SQc_TU_Y] `Ubc_Q`_TbQ^XQRUbcYT_$$ d_TQc_VQc SYSe^cdQ^SQc_TU_Y] `Ubc_Q`_TbQ^XQRUbcYT_$$$] eSX__S_^dtQb(_3: ^d_^SUc%tQ,fUj_6\UZQ^Tb_^e^SQ`_TbxQ_XQRUbS_^aeYcdQT_UcU^jj_`Ub(_4i_`b_RQR\U] U^dU\Qc SY56e^cdQ^SQc TU\,] e^T_U^ d_TQc \Qc UTQTUc fU^YTUbQc%_TbuQ^XQRUbcYT_] ei _dbQs_cQ D_TbuQs_^df^eQbUZU] `_%U^] eSXQc_dbQc_SelbU^SQc4dQ\uc S_] __c TU\QaeU $TU'U'T'UQ'Q`LUCULFQSW^TUG'UZQ'Tb_%U^_c] eSX_c]_] U'd_c SbudS_c TU cefYTQ%U'e^` UbeUv_`_S_ XQRbuQS_^fUbdYT_QVQUCSQQS_^dbQt_\4i_O'C_S_UCSQQS_\dbQt_\4i_O'C_S_UCSQQS_\dbQt_\4i_O'C_S_UCSQQS_\dbQt_\4i_O'C_S_UCSQQS_\dbQt_\4i_O'C_S_UCSQQS_\dbQt_\4i_O'C_S_UCSQQS_\dbQt_\4i_O'C_S_UCSQQS_\dbQt_\4i_O'C_S_UCSQQS_\dbQt_\4i_O'C_\dbQt_\4i_O'C_\dbQt_\4i_O'C$ U^ce UcdQT_% _c \eUbdUc bUf_\eSY_^Uc aeU TUc` et c ceSUT/waeU U^U,] e^T_ XQRYQR\U%TU U^TuQ~ GY^U] RQbW_%Ucd_c S_^cUZ_c `eUTU^cUb $\text{ceNSDYAUC} \text{ `QASQTQ` `UBC_^QS_$$ $^{\text{YMUQTQU}$NW$$} \text{ QAQS_$$^{\text{YMSU}}$} \text{ QAS}_$$ $^{\text{YMSU}}$ $\text{QACS_$$}$ $\text{ULCAQT_$$}$ TU QXS $\text{QYTQT}$$$$$^{\text{YMSU}}$$$$\text{QACS_$$}$$$$$\text{QACS_$$}$$$$\text{QACS_$$}$$$$\text{QACS_$$}$$$$\text{QACS_$$}$$$\text{QACS_$$}$$$\text{QACS_$$}$$\text{QACS_$$}$$\text{QACS_$$}$$\text{QACS_$$}$$\text{QACS_$$}$$\text{QACS_$$}$$\text{QACS_$$}$\text{QACS$ cub] 'k] _ TU d_TQ` Uta_ ^QaeU XQi Qf'f'ff_ U^ U\Q%U^ d_TQc \Qc UTQTUc%TUCTU_c dtl] `_c TU_c Q^dtfle_c ` b_Vtdqc%QTU` U^TIff_] sc f_\left ^\Left ^\text{LSY_^uc} _ Q&d_cTU\Qf_\e^dQTTU_cX_]RbUc%TUQbU^QcXQ;U^\Q_bM\QTU\]Q#M`_b_dQ^d_%Q]U^_caeU9Y_cXQ5U\Q]Qi_bUhQ\$dbbTi `UbVLSdQ] U^dU`BUFUbU\Yedeb_QSd_cTUf_\e^dQTUcTU_cX_]RBUc%d_TQc\Qc`BUTKSY_^UcaeUQWe^QfUj`\b_^e^SYwQSUbSQTU9QfYT%jUaeuQc% ?_cuQc%BQReS_T_^c_b%BYb_%6\UQYTb_4U^bUQSYw^S_^\Qc SeQdb_] _^QbaeuQc% \Qc bUf_leSY_^Uc U^U\U\Qc4i U^bU\QSYw^S_^d_TQc \Qc WeUbbQc% \$_^]_\$Y_\u%f\$d_bQc%Q`b_c`Ub#QTi \$QQ] \#QTUc%TU\$eQae\Ub\UY_c%Q\$Y_\uc_\$_] e^#QTUc U^U,] e^T_%Q^c\T_d_T_c cY^\$_^\$] \U^d_' XQTU`U^TYT_] sc f_\%Y_^\t__Q5d_c TU\Qcf_\e^^q\T\t TU_c X_] Rb\t%TU QbU^Qc XQ U^\Q_b\(QT\t\)] Qb M`_b_ d\?d\\Q] U^_c aeU 9 Y_c XQ\$U \Q] Qi_bUhQ\$ddeTi`Ub\U\$dQ}U^du`bUfUbU,\edeb_Q\$d_cTUf_\e^dQTUcTU_cX_] RbUc%d_TQc\Qc`bUT\\$\$Y_^UcaeUQ\We^QfUj`b_^e^\$WQ\$Ub\$Q ₫T_c c^^S_^S} \\Yd' \XQTU U^TYT_] sc f_\\Y_Uc_Q&dc TU\Qc f_\e^aQTUc TU_c X_] R\Le%TU QLU^Qc XQ U^\Q_b\\QTU\] Q\ M`_b_ d\^d_\Q] U^c aeU9Yc XQSU\Q] Qi_bUhQSddeTi`UbUSdQi U^du`bUfUbU,\edeb_QSd_cTUf_\e^dQTUcTU_cX_] RbUc%d_TQc\Qc`bUnTSSY_^Uc aeUQWe^Q fUj `b_^e^\$wQ\$Ub\$QTU9QfYT%jUaeuQc%_cuQc%BQReS_T_^_c_b%8Yb_%6\UZQ*Tb_4U^bUQ\$\\^\$_^\Qc SeQtb_]_^QbaeuQc%_\Qc bUf_\eSY_^Uc U^ U.) e^T_%(Q^c)T_d_T_c c^5__S} YU^d_! U^BU\Q\$YV^\$_^\Q; \$eQd_] _^Qbae\Q;% \Q; bUf_\eSY_^U; U^U\U\Q\$YV^\$_^d_I U^\B\Q\$YV^\$_^d_I Q; \webbec% \$_^]_\$Y_\U%f\$6d_bQc%Q`b_c`UbfqTi \$QQ|\ffqTUc%TU\$eQaeYUbBUY_c%Q\$Y_Uc_\$_]e^fqTUcU^U\U,]e^T_%Q^c\ff_d_T_ccY^\$__\$J\U^d_' U^bUQ5W^5_^Qc_SeQb_]_^QbaeuQc%_{Qc_bUf_\eSY_^Uc_U^U\U\Qc4i_U^bUQ5W^5_^d_TQc_\Qc_WeUbbQc%_^]_SY_^Uc%_8d_bqc%Q^b_c^UbbTQTi_SQQ[_\text{NOTITION}USeQaeYC_0.

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@\\rutator T∪\Qf_\e^qtor ?__^Qt\Q^`: Tg Qt/rc

9U] Q^UkQaeU%TU QSeUtIT_S_^UcdQ^_S%r^%9 Y_C ^_ \bUFUb\Qcf_\\SY_^Uc i QSSY_^Uc \\Rbbc_TU_c X_] Rbbc%tU_TuQ\ bUFUb^QTQ aeUS bbuc` ~TQ^Q\QcYbeQSW^TU\] e^T TU\QXe] Q^YTQT U^\Qc UTQTUc \edebQc4^ dQ^d S] U\cUbTUe^Q`Ubc ^QaeUTURU fYrYbU^t\3i`_TbxQ^S_^SUbTUQ^dU]_Q^_\ c UFU^d c%r^_\QaeUt\dbQUbxQTUXQSUbcU`QcQb`_bU,UndbQ bTY^QbY_YdUb_cYSW^ TU.ce` TUbY] UTYQd.4 S.cQc aeUTURU^\\\UMQbQ`QcQbU^\\] e^T] QdbbQ,^QxbbQ\% b\\Qc\\U UcT\\] fYj YU^d % U\Sebc TU \Q^QaebQ\Uj Q%U^aeUUc Y*TU`U^TYU^dU TU\Qc QSSY_^Uc e_RbQc TU\QXe] Q^YTQT3Uc TUSY%6_]__`_TbxQ%6_]_e^] QdU] sd6_] ei SQ`QSUciQcdbv^] %6 ^W&Q^UhQSddeTU\Ss\Se\TU\QcbUf\eSY^UcTU\cSeUb`cSU\Ucdulc%\Qc]QibucbeUTQcTU\Q] saeYQTU/QSWQSW^UhdUsQ McYdU^U] c U^SeU^dQU/Qce^d TUSUGQ%Q`QUUSUbs kQ` ^Uc `QtQS ^fU^SUb^ c%eU^ ` TuQ $XQSUbl_\%6_^SUbdUjQQRc_\edD\%\ bUft\ YS\ec_\ tcd_c': ^SeQ^d_QQQ^bJ_UbDWbC\ TUSYMQc\ S_cQc\ cU\ XQMQ^^_bQYdUb^_cYSW^$ Y^] UTQQQ UTAQDQTU\` TUbTU9Yc%tcdc^`eUTU^cUb`bUfYddc%Q] U^caeUcU`eUTU`bUfUbU^aeUXQRbs SQcW^ `QtQaeUcU]UZQ^dUY^dUfU^SYw^UhdtQbTY^QtXQMaeU^_cU`eUTU^`bUfUb%Q]U^_caeUcU`eUTU`bUfUbU\UcdQT_TU\]e^T_ \Qc`\QMQcTU:\W'd%\\Q\b\TU^SKY^TU\zbQu\\\eUkQTUt\\%QUh`e\c\KY^TU\\Qc\c\KU\^QSY^\uc\TU8\Q^\Qs^\%\\Q`e\uc\dQ\Q\zbQu\\U^ $\label{eq:control_control_control_control} QacUNQdUbbQ4`QxQd_T_c Ucd_c Ucd_hUbUNQT_c S_] _ S_^UbdQT_ S_^Nc S_c Qc aeU`UbdUNSU^Q, UcdQT_ TU,] e^T_] _bQ'$ 9 Y c ^^ eUTUS ^ SULDTU Q^dU] Q^ U\]] U^d] sc QTUSeQT i S ^fU^Yb^dU`QuU,TuQTU,ZeYSY i \QS ^YQWKQSW^Wb^UbQ,4 `QbQaeUTU`U^TU`bYSYQ]U^dUU^U\SebciUcdQT TUScQcU^U\]e^T] bQ'

 $\label{total control of the contro$

8_b_VQbY_'*' GUTUC`BU^TUTU\QcS_cQc_RcUbfQTQc%neUQ] U^_c aeU9Y_c`Buft U, E eUbbbTUQWU^dbc]_bQ\bc%neU^_`eUTUcUb SYbbd_aeUcU_RcUbfQ`_bU,Q`wcd_\GQ^dQW_%#=USX_c LJ'*1'\$ 8_^_SYTQc c_^Q9Y_c d_TQc cec_RbQc TUcTUU,S_] YU^j_ TUU,] e^T_'

8_b_\QbY_' + 6\`QbuSUb%Q] U^_c aeU9Y_c S_^SUTUQ^dU] Q^_aeUU. EeUbubTUQWU^duc]_bQ\uck\d_TQ; \\qc `b_\USuQc TU\Q: cSbbebQ ^_dbU^U^] UZ_b\e^TQ] U^d_aeUe^Q] UbQS_^ZbbbQ4i aeU%U^\Q] Qi_bQTUSQc_c%e^QS_^ZbbbQaeUTURUdU^Ub\Q] sh\j Q
\tag{VSUbbTQ} UbQR\U) e\bbetatTUJ_\\SY_^Uc\aeU0c\tag{T_U}\Q] Q\uck\deltatU\c_dT_\\Q\delta\tag{T_U}\Q\c_dT_\c\aeq

@\\#Uadot TU\Qf_\e^dot ?_^QX\Q^^: Tg\Q\$Tc

 $8_b_Qt\underline{Y}', 'HQ] RYCCUTUTeSU\%eUcYUcQC_SWCTUQWC_bQCSQTU_cVedeb_cJ_NSY_CUTU9Y_cfUbQ]\% UCFQC_LTZ_8 bbcd_% TUc'etcTU`b_ceSQb] eSXQc`bUTSSY_CUTWQTUcUY]`_bdQCdbc%uCVeSSY_CU_]_bQUcTU_cX_] Rbuc%AQtLbYf', '$:\SYU_i QdUbQ`QcQsC^4`Ub_]Yc`QQRbQc^_`QcQsc^i8_bQQY_'-'9UQ]Yc]QC_SWCTUQWC_bQCSQTU9Y_c%U cUWeYbQ%eeUUCFQC_dUUUt\]Yc]Q]UCeT_cUXQRQTUQc`bUTSSY_CUTUce`QQRbQ%S_]_UFYUCSQcTUS_CSJ_YUC_LWLY_4 TU_aeUUcce`bub_WQdFQS_]_9Y_c% ce`USeNQbW_bQ%eeU_TCdCWeUUCWbQC]UTYQTUd_T_c_c_d_d_ccUbuc4#8_]_UCSQCUUC4#8_]_UCY_HCSAY_bNWC2%)' bNY'1' 1' bNY'+*' bNYWY*-'$$

 $GY9Y_C ^QYUCS_^SWQSQITQTUX_] RUJWYYQUJTUYSWY^_b?UceSbcd_WYYQCf_YSY_^UcTUX__] RUJTUCTUVQSQITQ4UYd_^SUC^_QYUCS_^SW_C CQYd_CUY^YWY^CUYMT_4^YS__]_ YUC_YQC YQUBSWYS__]_ c_SYJTQTUC__^QSY_^Uc4i QcUQ`_bUUSSWY__`_b \\] UbQ`UJIYYWYTU ce fYbbT__ |QC ReU^QC__RUQC4__SeQaeYUb`UJIYYWYTU SeQaeYUbS_cQC__RUJUV_C U^UJUQSWYQce cQfQSWY4__ \\ SeQaeYUbRU^UMSY_aeU dUYUY^`_b8 bcd_%_SeQaeYUbdY__TU`UJ_Se`QSWYTU_c cei__c S_^e^FUTUYd_U$

6bW > : ^U, ce`eUcd_TU/Q\W_bQ^SQTU_c \edeb_c]_\\SY_^Uc_TU Q\W^dUc\\Rduc TU9Y_c\\aeUt\Qc\weY\\aeUt\Qc\we\we\aeUt\Qc\weY\\aeUt\Qc\we\we\aeUt\Qc\we\aeUt\Qc\we\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\\ae\we\aeUt\Qc\we\aeUt\\ae\we\aeUt\Qc\we\aeUt\Qc\we\aeUt\\ae\we\aeUt\Qc

@\\udotrT∪\Qf_\e^qdT ?__^QdKQ^^: Tg QbTc

`Ub_Ucd_ ^_ Uc] ei S_^c\cdvdUS_^ce dub_ TU 9\cc_RbUd_T_%RV^T\d_`QbQc\V]`\bU4\%eeU_ \bU \bucU^dQS_]_`_cu\T_TU db\capacate{MQT}`Ub\U5d\%_^cd\capacate{MQT}`Ub\U5d\%_^cd\capacate{MQT}`\Ub\U5d\%_^cd\capacate{MQT}\Ub\Capacate{MQT}\Ub\Ub\Capacate{MQT}\Ub\Ub\Capacat

6F<'\$'HQ]RYL^cUc\WeUTUUcdQ^S\w^\%aeUS] 9YcUccecSU`dR\UTUcUbQddu`YddL\TOcS ^dfeQ]U^dUTU\ aeUXQXUSX 4 `_b_ aeUTURU.cUbUh`eUcd_QUcdQbSQ]_RYQ^T__S_^cdQ^dU]_U^dU.ce.]_U^dUi_\Qc_YdU^SY_^Uc%U^_SeQ^d_Q.ce.S_^TeSdQV&debQ4QdUbQb_ $\label{eq:condition} \text{cec} \] \ \text{UTYTQC} \ \text{MbL} \ \text{C} \ \text{TVLU} \ \text{c/s} \ \text{VQV} \ \text{b]} \ \text{QSW} \ \text{TU} \ \text{'eUf} \ \text{c} \ \text{UcaeU} \ \text{Qc} \ \text{i} \ \text{b} \ \text{i} \ \text{USd} \ \text{c'} \ \text{DQQc} \ \text{cec} \ \text{b} \ \text{`wcYd} \ \text{c} \ \text{QQc} \ \text{b} \ \text{QQC} \ \text{c'} \ \text{DQC} \ \text{c'} \ \text{DQQ} \ \text{C'} \ \text{DQQ} \ \text{C'} \ \text{DQQ} \ \text{C'} \ \text{DQQC} \ \text{DQQ$ `Qaduc`bYSY Quuc Tu ce ucaeuij Q%5_j _ `uladu^usu^Q, ucaQT_ Tu ce lbuY_ j _bQ%TuRu cubcYuj `bu cecsu`dR\uTu cubb_d_%_bVQaQTu `bUfY:NV4idtU^UaeUUcdDbS ^dreQjU^dU` ^YU^T cecY:dujQTUTUbUSX c%6] cu` ^UYeUbQTUcUbfYSY%QdbQftcTU/Q S ^d/YWU^SQTU\Q: QSSY ^Uc TU\ c QWU^dUc] bQ\Uc3TURU cUbe^ GUb%aeU%U^\eWQbTU cUbQRc \edQ] U^dUY] edQR\U93TURU cUb ^USUCQXQ] U^dU_RZXd_TUYYYYXQ] U^dU\Q] sc ^e] Ub_c_c QSd_c TU QXU/ U^df_YU^d_% _c SQ] RY_c TU\QYYdU^SW^%TU SeQaeYUbcUbU^ $QRc_{ed_4`_bUcdQ.bQ; w^\Q^_\%eU.ce_] ei \ UhdU^cQ.SQbWQ.S_] `bU^TU e^YYW^dQ] \ U^dU_] \ Qi_b^x] \ Ub_TU \ QaeU\\Qc.S_cQc. aeU\\Uc_^$ S_AYWWAUCUYSYBd': ^dQ,cYdeQ5WYTURUdU^Ub`_S_] sc aeUXQ5U6% Ub `QbQ bU`QbQb\ c U^Q5Uc b d c%QcuS_]_\U cUQ`_cYRU% `eUTU BUSOMSQb ce SeUb`_TUcQbdSeVQT_i _c]_fYj YU^d_c TUc_bTU^QT_c%TU\Q] UZ_b] Q^UbQ U\ SQc__`Ubj YUVAU GUv_bGe`bUj _ TU d TQ:/Q:S cQ:TURU^^USUcYTQTUc UcdQbRQZ WKQ^TUc TUcfU^dQQci] Y:UbQRUc%U^U,WRYUb^ TU,] e^T aeUt/XQXUSX % TU/Q $aeUdU^\prime WQQceSQbW_\%QdQftcTUcecUbd_dQ]~U^\prime dUY^SQ^\prime Q TUTUcSeRbbS_cQcTU]~Qf_bhf ``_bdQ^\prime SQ \%aeUU^\backslash _ceSUcY_aeUXQTU$ fU^bce c'tdJ] Q4`QtQ_SeQ%tY^__XQSUQ% Ub_cQRU%eU`_TbuQXQSUbaeU U\ce] Y^tdb__`_bde^_': ^] eSX_c SQc_c% eUTU cUb] ei WKQ^TU/Q^USUcYTQT aeUTURU`kUf'Ub%U^\Q\b] QTU cec`UTYT_ciTr\`_^Ub/Qc S_cQc% QbQ QWe^_c WkQ^TUc Uf'U^d_c aeU XQ^TU _Sebbb97U\QfQcqQiUndu^cQYYVeU^SQ%ie^cY^YfYj`_bq0/SQ`QbQU\e^fUdc_4aeU`eUTUfUb]scdQbTU%5eQ^T_iQUcTUJQcYQT_ dQ5TU% `eUTUTUcUQ5U^fQ^ aeUXQRQS ^SYT Q^dUc%eU` TbQXQRUb bTU^QT Qcec Qce^d c U^S ^cUSeU^SQ MUc U^U\` TUb TU, X_] RbU%U^ Ucd_c `b/^SYY_c%_bcec Trć`_cdf_c% b_`wcd_c i QSSY_^Uc%_b_ dQ^d_TUSU`SY_^QbQ9Y_c%b_] `Ubcec] UTYTQc%U XQSU^SQ] RYQbTU_`YYW^S_^dI^eQ] U^dU%c_] UdUb_ QTYtWecd_% ddQUb_ Q\QS_^\ecYw^

DUb_%Swi]_ Ucdoc S_coc cUS_] `_^v^S_^VQbd; w^_S_^VQ`QQRbQTU9Yc5 @_aeUbu`buctuUv,`brSr`Y_U^ce__Yrw^4i TU9Yc%dT__aeUd0r'U aeUXQSUbSQTQfU;%d_T_U,UcaeU] Qi VQcUbbUTUcec_`Ub0SY_^uc%_^`Ub0BdQi UrduTucTUU,`brSr`Y_U^ce__`Yrw^4i TU9Qb0%aeUd_T__ aeU_c Trc`_cYdf_c i TrcUv_c Ucds^U^_c S_bQ;_~uc TU_c X_] Rbuc%U,S_^cUZ_TU,GUv_b`Ud; Q^u5Ub5%; _c`U^cQi Yu^d_c TUce S_bQ; w^`_b

@\\RUadTTU\Qf_\e^dT ?_^QXQ^: Tg\Q5Tc

9UQSeUbT_S_^U, UcaeU] QaeUUcd_i UcV_bjs^T_] U`QbQbWedQb%QSQJTQTU_cs^WUUL ^Y_c X_] RbUc ^YcU`_T\Q`bbFub% 9Y_c TURUcUb] ei S_cQ: aeU9Y_c XQXUSX_U^U, b_SUcQ} YU^d_TUUcd_c TY:Uv_c%TURU cUbcw_ U, Ved_TUce `b_`YQTUSU`SYA^4QddWSY_c `QtQ!U\ QtQ;WQcuS_]_ `eT_%cecYcdU]Q%aeU_b%M^Q}U^dUUbQ]eiReU^Q%i`UbUbCbQ}U^dURU\\QA`Ub_UcdQRQb_d_iS_^\e^TYT_`_b\Q\\RbUf_\e^OQTTU_cs^WUUci_c X_] RBJL' Md_TQFiQ dDr'U aeU`_TUbcUbd_dQ] Ur'dI TUSU` SY_QT_`_bcUMe^TQFUJ 3t\^_`_TiQcQRUb%aeUTURU dUr'Ubce t h'd_TUcUQT_%Ur^Q $\mathsf{CQRUBMUC} ` \mathsf{et} \, \mathsf{c} \, \mathsf{TU} \, \mathsf{d} \, \mathsf{T} \, \mathsf{y} \, \mathsf{c} \mathsf{TU} \, \mathsf{d} \, \mathsf{TU} \, \mathsf{y} \, \mathsf{d} \, \mathsf{TU} \, \mathsf{U} \, \mathsf{d} \, \mathsf{d$ $Swi_-Uc\ `_c'R\backslash U\ aeU\ 9\ \underline{'}\ c'\&'\cap\ `UU'\ UbJ\ _\backslash \&Y\ 'Uc\ TU\ _c\ X_]\ Rbbc\&QRUbc'YQWe'^Qf\ Uf\ f_\ [VU\ LbQ\ \backslash QSbc'dQ^TQT\ TU\ UcdQ\ Q`\ _cdQcdQ`\ MTU\ aet\]\ Q'UbQ\ .$ 'RQQ' bUTUS'baet dQ^` b_^d_U] `Uj QbdQ5: \Q` wcd\TY5U%5_] U^j wQddQRQZQbU^ce dUJ `_4i S_] _ ^ `_TuQcUbS_^ST_ XQcdQaet `e^d_cU `b_SUTUBQU^UcQUTQT5 G8%6_] _ ^ `_TuQcUbS_^_STf_ aeU U, UfQ^WU\Y_aeU ^_ UbQUWSQ] `QxQ\QBUY_bj QTU_c ?eTY_c%_\fubQQcubUMSQI `QDQU\MD_TU\Qc`~QSY_^Uc``QMQ^QcTUceQ`_cdQcuQ``QMQ^_c%eeUXQRuQ^cYT_ S_^MG| QT_c U^dQ^d_c cYM_c5 cYUncdUU^BUQ\YTQT cUbuQe^Q] e^T_ SbbdQ^_%Q_ aeUUbQ`U_baeUU\`QMQ^b(] _4aeUS_^df^ewTebQ^dU] eSX_c Qv_c' oMSwj _ Uc`_c'R\UaeU9Y_c%p``bUFUbJ_\\SY_^Uc TU _c X_] Rbbc%cRubcYQWe^QfUj f_\fUbQ\QSbcdQ*TQTTUUcdQQ`_cdCuQ5 MTU aet] Q^UbQ`RQQ`bbTUSbaet dQ^`b_^d_Uj`\ujQbQ5:\Q`wcd\ S_^SYT_aeUU,UFQ^WU\Y_aeU^_ULQUNSQ; `QLQ\QLU_LI; QTU_c ?eTY_c%f_\FULQQcUbUNSQ; `QLQU,WIb_TU\Qc ^QSY_^Uc `QMQ^Qc TU ce

 $Q^* = C_{\text{ACM}} \cdot Q_{\text{ACM}} \cdot Q_{\text{ACM}}$

@\\rundom \tu\\qf_\e^ndm ?__^QX\Q^: Tg QbTc

BXL:W TU cUbTUSU`SY ^QT U^d TQc cec Rbq:%YdQ] `S S ^ce VbqSQc TU ce VY^%L/^d T \ aeUt\XQ\\UFQT QSQR '

GUSSYı^L≯

 $= QRYU^T_TU]_cddQT_%eU9 \times GdYU^Ue^SYUdd_UY^VQXRUUDUUCSYU^SUTU_cQSd_cf_/e^dQbY_cTUQWU^duc]_LQUUC%EU^W_QX_bQ%U^CUWe^T_ /eWQ5%Q5Q]_cddQb/QS_^cUSeU^SYQ4Swi__cUCYWeUTUQaeu%aeUUcd_cUFU^d_cc_^^USUCQbY_c%s_^e^Q^USUCATQTTU /QS_^UFW^__S_^cUSeU^SYQ$

@czwctu/ccccutatorcqi yyorc%_b/_aeui_xuduyt_'`_bueytottu/cccbaeuu^`Quase\Qbi \Q`\uvqs_cytuboswy% eutucub
`uwusaqi uvautuuli yyoro; Qcuqtuxusx__^'

*' =U_RcutfqT_Q^duc%u^\Quh`\\SQSw^TU\Q^QabQuj QTU\Q^uSucYtqT%TUaeUU^S_cQc aeUXQ^`QcqT_%e Uhcdu^SQ`QcqTQuc QX_bQ^uSucQbY_3i QXQRYU^T_QcUwbQT_TU\Quhcdu^SQ%ucTU] Qc\QT_dQbTU`QqQSeQaeYub`_c\R\YfqTTUQdubQSw^U^ucUcUcU^df_4 QX_bQucYj``c\R\UaeUTURUbQcub] sc aeUSYbbl %aeU\QS_cQXQUhcdff '

 $+ GYXQ; QWe^QS_cQS_]_ = e^Q`LUcSU^SQTYYQTU Qcf_\SY_^UcTU QWU^dUc \RLUC%eU DLUcSU^SQ%_b\Q ce`_c\SYW^Uce^QS_cQaeU i QdU^U% XQSU dU]`_ dU^Q\QUhYcdV^SQ4i`_bUc_%QX_LQ ce UhYcdV^SQUc^USUcQXQAQX_LQUc S_]`\UdQ| U^dU]`_c\R\U cUbTU_dtQ] Q^ULQ%eU UcdU S_^S] \Udq| \LUYU_d\[\LUYU_T \LUXU_LQUCUL_T \LU$

, 'HQ] RYL^UL'] ei] Q^WCLd_%eU/Qc S_cQc aeUUcds^YTYc_\eR\U] U^dUS_~USQT_c S_^_ddQc S_cQc aeUc_^~USUCQCQc_^Qce
fUj Uc ^USUCQXQ' 6] UTYTQaeU/Q`b_`_cYSW^Sei Qf USTQT Ucds ^USUCQXQJ U^dU UUQSY_^QT__S_^_ddQ`b_`_cYSW^%aeUUc
*\USUCQXQJ U^dUSYUdg_%Lc U^cu] Yc] _ Uc ^USUCQXQJ U^dUSYUdg_' 9USYU_S_^ddQY_cUbQc_^CS_^ddQTSSW^3cUbQQ\U_VUSQSW^UUCQSW^UUQSYW^UUCQSW^UUQSW_OUJ RQXW_^_ VeUQcu%cY_ aeU`eUTUcUbb_d' GYUc_%QUhYcdU^SQTU/Qc SeQUc Ucds
*\TYT'c_\eR\UJ U^dUS_^USQTU_S_^QW_Sei QUhYcdU^SQUc ^USYUCQSYU\QCSYU\QCC65T_^_cUQUFYTU^dU%aeUU,\USd_bZej WeU'
*_cYR\UJ U^dUS_^USGTU_AeU\QQS_^UhYwYYTYC_\eR\UTUCc UhYcdU^SU &GYU\QCC65T_^_cUQUFYTU^dU%aeUU,\USd_bZej WeU'

@\\ruadot tu\qf_\e^dot ?_^QXQ^: Tg QbTc

- 'B_ Uc] U^c Urtundwaeuchxa e^s__si ynd `bury s] `\udweb_%undakutulaukundaanakebatula f_\se_i aeu

Tu Qwundus] _bauwas_ndreamaka aeu sababaraka aku undakuundaanakebatula f_\se_i aeu

Dbussan sau eu s_ nsaatas_nus saatas nus sau aku undakundaanakebatula f_\se_i aeu aeu aeu saatas nus s

⇒EeU YWK^Q5_NUSI YU'd_Vedeb_` eUTU cUbSYUbQI U'NU S__ST_TU QYUI Q_%ei QUhXdU'SQUC S_NYWUYU% CY ^USUCITQT TU d_T_%

`eUTU cUb`b_RQT_ '_bb_ dQYd_4Uc II `_cYR\U aeU e'QS_cQaeU cU cQRU SYUbQI U'NU QSeQaeYUbYdUUSd_cY` beURQc' Ge`_^ub_ S_ndby'%

II `\\SQe^QS_ndb\TSSW'3`_baeU`_be^QS_cQaeU cU cQRU SYUbQI U'NU QSeQaeYUbYdU'TI YU'd_%Lc `QxQaeU cUQUI'ITU'NU `QxQaeU \Q

S_] `BUYCW'% `QxQaeU e'QS_cQcUQUI'ITU'NU `QxQSeQaeYUbU'NU'TI YU'd_aeU Lc _] 'c] _%S_] _ `QtxQaeU cUQUI'ITU'NU `QxQaeU \Q

UI'NU'SQTU aeUB`Ub_ ^YWe^QS_] `BUYCW'%SBUQTQ_ YSBUQTQ% eUTU f Ub\QUI'ITU'SQT_^TU ^_\QXQ\4`_b_aeU Uc _] 'c] _%S_] _

`QxQf\UbaeU `QxQcUb_aeU ^_ _ Uc' M`_b_d\yae\XiYXQ QW_TUf\UbTQT aeU Uc QRc_\edQ] U'NU'Y` beURQc'%aeU\Qf\UbTQT Uc

QRc_\edQ] U'NU'I ` CR\UTUS ^ SUB%TU d\yae\UbqaeU'I] `\\SQe^QS ^NdQT\SSW'ce` ~UbaeU cUcQRU

@\\#Uadot TU\Qf_\e^dot ?_^QX\Q^^: Tg\Q\$Tc

8 ^c\TUBU] c Ucd U^e^UZJ]`\'Ge` ^WQ] c aeU XQSU SYS] \\cubuSYU^d c cUcU^QQ \quad c\% XQRQ ^YWk^ db cUb%Y` U,GUb9YY` 4i \eUW $\label{eq:local_energy} $$ Ucdu] = ^T_{\@} QWk^SeUb __ Uc \width U^ \cos ^Q \width$ $TU ce \ Uh'x'dU'SQ4_SeQaeYUbTU'\ U'TU'SQ''_S_'Uh'w'\ U'\ QRC_'ed_S_'SeQaeYUbS_cQQ'dUb'_IBM_T\W_'%eU cYUcd_cU ce`_'U'%'__XeR__Uf'\H'U'SQ'__IN COMMON COMMON$ TUUCUUFU'd TUQʻdUJ Q^'B XeR Uf`NTU'SQTUaeUcU`eUTUfUbU^\QS cQ] Y;] Q4`b\QS cQU^cv% bU\]] U'd %'\ UbQ M^ XQRuQ $\label{eq:cestimate} \text{CeStW} \text{ B} _ \text{XeR} _ \text{UF} \text{TU}^\text{SQ} \text{TU} \text{Q}^\text{d} \text{U}^\text{sQ} \text{U}^\text{d} \text{U}^\text{eq} \text{U}^\text{eq} \text{V}^\text{eq} \text{V}^\text{eq} \text{U}^\text{eq} \text{V}^\text{eq} \text{V}^\text$ _dbQ.5_cQ%_U^\eVIQbTU^QTQ M.cYUc.Qcu%u^d_'Suc.d_TQc.VQc.5_cQc.Q^duc.UbQ^UhQ6dQ]_U^du^WeQUc%; _] 'x]_%5_^buc`U5d_QUc_i _dbQc.5_cQc `_cYR\Uc4^_XQR\Q`\bU`_^TUbQd<u>Y</u>^%_`\Uc__U\fQ_bce`Ub<u>Y</u>b4i`_b_dQ^d_%QTQTU_aeU`_Tb\QcUbTUe^`Uc__fQ_b`Qb\TUdUd] YQb SeQaeYLbU^dU^Tr] \Yu^d_! @\S_cQULQQRc_\edQ] U^dUc\n^\beURQc% QRc_\edQ] U^dU\n^S_W_cSR\U | ^Qe] U^d_TU\QS_1 \bu^c\m^%_TU\Q SQ QSTQT TUTYCSUb196% dt/10 dt/TU1SQ% ^ XQSU 1/YVK^QFQYSU%QQSQTYCSUb196cYWr c UFYTU1SQc TU aet/%aet/culq ^ Qe] U1dwdQ1d 4ct/%Y $\text{cUQe] $U^*QVYY'QQ] $U^*U : Qe] $U^*Q = U^*Q =$ $=:\!\!9\%`\texttt{b}_{\text{W}}^{-1} \text{U}_{\text{W}}^{-1} \text{U}_{\text{W}}^{ \label{eq:condition} $$ C^U_1 = C^U_2 - C^U_1 - C^U_2 - C^U_1 - C^U_2 - C^U_$ `UbjY005TY5SUb^16S^WtQ^SUbdUjQaeU^XQi ob'aeU`UbjY005sfUbdT\ aeUXQi%\`QtQfUbQ\Q`UbULSSW/%\S^VQ5KYTQT4cY^UjRQbW%` S_^WKQ^SUbdUjQaeU^_XQi__ob_'aeU`Ubj\dtsfubd_T__aeUXQi%i`QtfubQ\Q`Ub\U5SYW%iS_^VQ5KYTQT4cY^Uj_RQbW%_dbU^UdU^TU^S\QU^ aeU ^_ XQi _db_'

⇒ Ge` ^ub\Qc\eablqcf \%Y ^ucTuQwu^duc] bQuc ^ cubufu^d c^uSucQx c4 % aeU uc\] \cdot] \% c ufu^d c aeU ^ uc 'Ŋ``_cYR\U% Ub_aeU ^_`eUTUfU^bQ`QcQxHicY`UJRQbW_%ce`_^UbaeU 9Y_cS\UbadQ}U^dU\UcS_^SUTUQ^dUJQ^.% S_^SU d_TQ; \Q; S_cQ;4Uc ce`_^UbU, S_^Sij YU^d_TU9Y_c Uc YS_] `Q#R\US_^Ui] Q; DQ;QaeUTUSY%aeU9Y_c%;YTeTQ% cY^aeU d TQS_^ZLbbLQ%cQRU aeU e^QS_cQfQQcUbY^Q\R\U%aeU%Q, [\tau] _ dtU] `_ aeU cQRU aeU Uc `_b_ S_^dr\WU^dU%aeU%_c\R\U] U^dU% `eUTU^_cUb_%Uc ce`_^Ubce S_^_SY_YU^d_Y^S_] `QXR\Uc S_^U\] Y{]_4_aeU e^QS_cQaeU cQRU%Uc S_] `\Ud0] U^dU $Y^{S}_{C}(dU^{S}_{C}) = dQS_{C}(dU^{S}_{C}) + dQS_{C}(dU^{S}_{C}) = dQS_{C}(dU^{S}_{C}) + dQS_{C}(dU^{S}_{C}$ aeUt\cQRUaeUUcTU\QfUbTQTYSYUbdQS ^dYVWrdU GYe^\edeb f \e^dQTUcdQ^cY^dTQ^USUcYTQT%aeU^QTQ\ji `YTU% Ub ^ `eUTU cUb%J^d_^SUc \Q`b_`_cY5W^aeU QXbJ_Qce UhYcdJ^SQ\édebQ%Jc dQ^Y^SVbdJ_%aeU ^QTQ\J_`\fTU%cY^_aeU \Qf UbTQT TU aeU `eUTU VQ\Qb` bS] `\Ld' McY9Y cS ^ SU dTQc\QcS cQc%t\cQRU aeU UcdQ`b` cYS%r^cUQ` b\ dQrd YYSYUbdQ MaeU Uc YS_]`Q&R\US_^ce cQR\U^T_ aeU Uc fUbTQT Y\Q\R\U4i dQ^YS_^c\u2du^dUS_^ce Y\Q\R\U QcQR\U^TQ; TU aeU Uc S\Ubd_' GY\QS_cQ Und nSuc Uc ` cYR/U aeU nenSQ `eUTU cUb3i cYUc ` cYR/U aeU nenSQ `eUTU cUb39 Y c cQRU aeU ` cYR/U] UndU `eUTU n cUb4i aeU Uc cQRUbaeU\Q`b_`_cYSW^aeU QXfg Qce UhYcdU^SYQ%_cYR\U] U^dU% eUTU ^_ cUbSYUbd_4i aeU Uc cQRUbaeU\Qf UbTQT TU U_ Uc YSIDbd 4\ aeU cYTETQ Uc YS] `QDR\US ^ce cQRUbS] e^QSIDbdQf UbTQT' GYf \\SY ^Uc c ^U^cu] \tag{c QS ^dUSi} YU^d c Tudubj Y^Qb`Ubu^d_bQj U^du aeUfQ^QcUb4cY_`_bu\S_^dbQbY_%c^QbWej U^d_TU\Q`WY_bQ^SQi_U\Ubb_b4`_baeUcUbbQTYcSedb% aeU ce`_^U aeU \Q`b_`_c\\$\\\^cUQ \$\\Ubd\\%

@\\#Uadot \to\Qr_\e^dot \ ?_^QX\Q^^: Tg\Q\$Tc

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 $= Q \cdot dQ \wedge dQ \cdot J \cdot _c \wedge R \cdot M \cdot Q \cdot S \cdot C \cdot aeU \cdot C \cdot S \cdot _c S \cdot _c S \cdot _c T U Q \wedge U J Q \cdot _c Y \cdot VQ \cdot W \cdot U \otimes U \cdot S \cdot _c AeU \cdot U \cdot _c J \cdot _c Y U \cup U \cdot U \cdot U \cdot _c Y U \cup U \cdot U \cdot _c Y U \cup U \cup U \cdot _c Y U \cup U \cdot _c$

M`_b_ dQ^d_%cYXQ_QWe^Q%dQuc DBucSYVSQ% QaeU cU XQTU] _cddQT_ \QXQ %J^d_Suc BUSUcYTQT TU S_^UhYw^i \QS_^cUSeU^SQ^_Uc U^QXd_%cYXQ_QWe^Q\RUmdQT aeU u, X_] Rbu%_SeQaeYbb_ddQSbQbbbyYrYbedQ MQ`QmbTUQXucU`eUTUTUTeSY% aeU_c TUSbUd_c QRc_\ed_c%aeU ^_ TU_d_T_ Qe] U^dQ^\Q\Q ~USUcYTQT%_ c_^YS_]`QdR\Uc S_^\Q\RUmdQT UAU_i`_cYR\UcY_ aeU UX_] Rbu W_j Q%J^ SeQaeYbb_TUSbUd_c QRc_\ed_c C_^YS_]`QdR\Uc S_^\Q\RUmdQT UAU_j`_cYR\UcY_ aeU TURU\\UWQbQ `QcQb D_b_ dQ^d_%cY_c TUSbUd_c QRc_\ed_c C_^YS_]`QdR\Uc S_^\Q\RUmdQT TU_X_] Rbu S_]_QWU^dU]_bQ%_ce \RUmdQT U^e^ UcdQT_TU\\RUmQDT S_^TYYLDGT S_^QAeYbQaeU cUQ\Q\\RUmdQT aeU\\U\&cdQ%_Uc QSQccQTU SeQaeYbb^UsUcYTQT aeU\\Qc TUSbUd_c QRc_\ed_c YYUbU^

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COMPRINCE SOLVENING SOCOUNTS ON THE STREET AND THE

$$\label{eq:hamiltonian} \begin{split} &H_T_S_{S}^{S} \| \text{VVd}_{S} \text{Var}_{S} \text{Var}_{S}^{S} \| \text{VVd}_{S}^{S} \text{Var}_{S}^{S} \| \text{VVd}_{S}^{S} \text{Var}_{S}^{S} \| \text{VVd}_{S}^{S} \text{Var}_{S}^{S} \| \text{VVd}_{S}^{S} \text{Var}_{S}^{S} \| \text{Var}_{S}^{S} \|$$

@\\RUMDTTTU\Qf_\e^dDTC ?_^QX\Q^^: Tg\Q\$TC

SDDG Z LO NOS NEGLIO STORM OLIVI Z GEOLO XOLIO ALME AC STRUM OLIVI S J SM MAG CALINO GEORGE OF TANGEN OF THE SECOND OF THE SECON

SYLbd_' DQtQSUbdlj QTU\S_^Sj YL^d_ Uc_btQS_cQaeU cQRUb_ TYSUb^Yb\QSUbdlj QaeUXQi U^\Qc S_cQc] Yc] Qc%aeU c_^ S_^SY_c'D_b_dQ^d_TURUXQRUbe^QSUtatlj QU^_aeU cUQe^ddtdU^_TUSUtatlj QTU\S_^S\j\Yu^d_% aeU`tbucdUS_cQc $\label{eq:cecSU} $dR\backslash Uc\ TU\ CUDS_^ST_\ \ QtQ\ UcdQb\ CUWeb_'\ M^\ XQ^TQ]$ sc aeU\ \Q^USUCTTU\ \Qf\ UbTQT\ S_^STQ\%$ aeU\ \c UQ.$ 'ij`_c/R/U%Y_ aeUTURU cUbfUbTQT4_%U^_dtQc`\Q,QRbQc%QS_^UhYw^.Wdj UUY^VQ,\R\U U^dtUU,ceZUd_i U,`tUT^SQT_TU\Q `b` cYSM/^aeUS^dU^UUcQfUbTQT'HT SUbdUjQTU\S^SjYU^dS^cYcdUU^\QfYcdQTU\QWgJUjQTUUcdUbUc`USd'HQ^ SYDING_S_^SY] YU^d_`BUFY_TU\QUIYXGUYSYQ\&debQTUSeQaeYDOQS_^dUSY] YU^d_TU9Y_c%Uc ce fYxYw^TU\QS_^UHYW^XYG] UU YTYC_\eR\UTU, ceZUd_i U, `bUTYSQT_TU\Q`b_`_cYSYw^aeUQXIG_Qce_UhYcdu^SYQ\e6ebQ:\dJ]QUc_aeU`_cYR\UUU'U^d_4U, `turnsqr_uc ce unicaursiqiedetiq% ub_ciyiqunicaursiqiedetiqucaqbiytaj uj urauluyinic jerijuj urauls rusaqr_s ruculururali% ddQJU^dUS^dYWU^dU%`eUTU`cYR\UJU^dU^cUb%u^d^SUc%aeUfUe^QS^Uh\w^\XdJUU^dUle^ceZUdie^`bUTYSQT aeU ^ Ucdt^S ^USdQT c Xtg| U] U^dU4\ SeQ,Uce^QS ^ddQT\6S%/^9UZ aeU\ aeUU\9b K XXRi T\6UaeUUc S\0dd \%aeUU\] Ub S_^S1_VU^d_^Q_QUSdQQ\QS_cQS_^S1TQ% QtQaeUcUQ] sccUWeb__] sc \(\text{cdeb_'DUb_%Y^U] RQtW_97TW_%CUce`_^Ui TU] eUcdaQ\ aeU XQi aeU cUbi Q%Q^d Vedeb i TUdUdj Y^QT_4Uc TUSY\$%USUcQ\$Qj U^dU Vedeb ':\S_^Sj YU^d TU\ Vedeb % ce`_^U\edeb_4i e^SYUbd_5_^_S}}\U^d_TU_\edeb_%ce`_^U\SYUbdQ\edeb_%Q^dUSUTU^dUTUaeU\SYUbd_c\S_^_S}\YU^d_c' DUb_^ $XQ_{-}dQ_{-}SUddQ_{-}df_{-}SUddQ_{-}df_{-}SUddQ_{-}df_{-}SUddQ_{-}df_{-}SUddQ_{-}df_{-}SUddQ_{-}df_{-}SUddQ_{-}df_{-}SUddQ_{-}SUdQ_{-}SUddQ_{-}SUddQ_{-}SUdQ_{-}SUdQ_{-}SUdQ_{-}SUdQ_{-}SUdQ_{-}SUdQ_{-}SUdQ_{-}SUdQ_{-}S$ $S_cQbUce\dUfUbTQTUbQ4_\%_aeUUc_]Yc]_%Q^USUcYTQTTU\UfU^d_'$

=UTU cWQQbe^QS_cQ] sc4aeUcYUcS_] _ Uc_c UcSbd_kUcQ^duc] U^SY_^QT_c ce`_^U^%aeU\Q`kUcSYU^SQTU9Y_c^_ Uc\Q SQecQ%cY_ U, UWLSd_TU\QUh'xdu^SQTU, UfU^d_S_^_ST_TUQ^dU] Q^_4Ucd_UcdQ^\UZ_cTU] _cddbaeUucdUS_^SI_YU^d_\
`kUfY_%_` kosdsQY^Wbb\Q^UsucYTQTTU\QUh'xdu^SQTUUUcUUfU^d_%aeUcU] eUcddQ] sc RYU^Q,S_^ddQbY_%W,] Qi_bS\QbYTQT\
D_baeUTU] eUcddQ\QUh'xdu^SQTU, UfU^d_aeUcUkbceUfQ`_bUcdQfuQi Wdi U%aeUucS_] _ cYi QXQRuQcYT_4`eUcd_aeU%U^
UWLSd_%aeUU^kUQ\YTQTi QUh'xdu^SQVedeb_i QXQdu^YT_YWeU^SQi UWSQSQkUQ% cUXQ`b_TeST_e^UwLSd_%Q
cQRUb DbUcSYU^SUBUh'xdu U, UWLSd_i Q4i S_] _ U, UWLSd_ce`_^U\QSQecQ% TU`U^TUU^dUdQi U^dUTUU\Q%_b_dQ^d_%Lc
S_] _ cYU, UfU^d_Vedeb_%aeUuc \QSQecQ%QXQRuQUh'xdT_':\UWLSd_Uc Wdi US_] _ cUQ`_cYR\U% QaeUd\UYU\Q`_cucYw^TU
\QUh'xdu^SQ% cUXQQcUWebQT_TUU_' DUb_U, UWLSd_^ `eUTUcUb] sc Wdi Ui UcdQR\UaeUce SQecQ%eU_% \QbQ;w^':\
UTWSY_^ _ `eUTUcUb] sc Wdi UaeU\QVe^TQSW^'

>`QQQYecddQbUcdQSeUcdWr4ce`_^WQ]_c\QcQ`QXUrSQci\QcYjsWUrUcTU\QcS_cQcUrerfQc_%_bUZU]`_%e^dUUcS_`Y_bUXUSd_b%
cYUrT_\cUVUSd_cbUXQbcTU\cSeUb`_cSUUcdbc#QTKdQrSQiVeUQTU\QfYcQ\$%aeUcUQcUJUZQr3cYUcQcuNurd_rSubwSc_]_ UcdQc
YjsWUrUcUrUxduUcS_`Y_XQrdurYT_erQUnYcdUrSQbUQ\`QcQT_%iUcS_rfUbdT_S_]`\UdQ\UrduYj`_cYN\UQX_bQaeUTURUbuQcUb_ S_rdQXcTU_aeUXQrUnYcdf_4QcYaeU @\\ruadpt \tau\qf_\e^dqt ?_^QXQ^^: Tg\QbTc

CdtQS_cQaeUcUXQTYSX_`_bQWe^_cQd;Y*Q^_c%QtQTUc`UWQb\QVeUtjQTU_aeUcU\j``e\cQTUcTU\Q`tbLcSYJ^SQTU9Y_c%_^dtQ\Q S_^dYeQSYw^TU\Qcf_\YSY_^Uc TUQWU^duc]_tQULcdu`b_`wcYd_4 EeUSeQ^T_cUXQR\QTU\Q`tbLcSYJ^SQTU9Y_c%_XQie^Q UcdbSdQS_tbUSSYw^U^^eUcdtQ]Q^UtQTUXQR\QddiaeUcYRYU^UcfUbTQT%aeUXQiU^9Y_cU\S_^_S\jYU^d_]sc`UbUSd_TUd_T_c_c

Ltdbsq/S_bbJsSw/U^^eLtdQ] Q^UbQTUXQR/Qbdi aeUcYRYU^LtfUbTQT%aeUXQ U^9Y_c U/S_^_S\] YU^d_] sc`UbVsd_TU_d_T_c_c
UfU^d_c TLcTU_cYJ] `bJi `QbQcYJ] `bJ%c^UJ RQbW_%_ XQ dQ,S_cQS_] _ Q^dLi e^TLc`etc U^9Y_c%c^_ aeUfU_d_TQc \Qc S_cQc S_^
e^`e^d TUfYcQY^] edQR\U`UbVsd %c^^YWk^ceSUcYW^ &QUcd bJc`eUcdQ3

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9 Y.c f Ub/Qc S_cQc TU] Q^UbQ dQ^`UbXUSQU U^Q\ubQR\U] U^UbY\sQ QaeU^_ XQ ceSUc'\w^U^cce \\frac{\text{TU}}{\text{L}} \\ \text{L} \\ \text{L

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#'\$@] Y:] QIQ w'%`_baet U,S_^S] YI'd_TU9Y_c Ucc'CeSUcW'%Lc%_baeU Lc Qc_led] U'du`UbUsd_%LvU] Q_b

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i `\U'YbET4\ebb_\Qc S_cQc cUfU'S_^OQYQS\QBTQT%S_] _ cYUcbefYUbQ^` BLcU'du_\Qc S_VQ] Y:] QUFYTU'SQ

i`\U'YbET4\ebb_\Qc S_cQc cUfU'S_^OQYQS\QBTQT'%S_] _ cYUcbefYUbQ^` BLcU'du_\QfYcQU\c CYI] YUU'\QS_cQS_^STQ%

Qc_\edQ\i QRc_\edQ` UbUSSYW'S_^cdQ^dUQT] YU 'Y'Vb^^QQdUQSYW'% QcuXQ ceSUcW'\4\QUhYcdU'SQ\bUQTU\QS_cQS_^STQ%

^_cYWYBSQU'QRc_\ed_\Qe] U'db_QvQTbQQ\QS\QBTQT_Subliq\T_SQ\bU_S_^ST_39Y_c\|Q] QQ\Qc S_cQc aeU^_c_'%S_] _ cY\
VeUbQY4d_T_c U_c c_^e__S_^t\\S] _ cY\QXeRYUbQ^UhYcdU'SQ\S_0\S_1 _ cY\QUhYcdU'SQ\S_1] _ cY\QUhYcdU'SQ\S_0\S_1] _ cY\QUhYcdU'SQ\S_1] _ cY\QUhYcdU'SQ\S_1] _ cY\QUhYcdU'SQ\S_1] _ cY\QUhYcdU'SQ\S_1] _ cY\QUhYcdU'SQ\S_1] _ cY\QUhYcdU'SQ\S_1] _ cY\QUhYcdU'SQ\S_2 _ CQc aeU^_c_'%S_1] _ cY\QUHYcdU'SQ\S_1] _ cY\QUHYCd\S_2\S_1] _ cY\QUHYCd\S_2\S_1]

#/\$@Q_RZU5W^cURQcQU^\QY^] edQRYMTQTTU\S_^SN|YU^d_TU9Y_c%eUc.Uc.\QYY] edQRYMTQTTUS_^SN|YU^d_aeUXQSUaeUcUQcY^ceSUcYw^ $TU / Q U h c d h^2 d D_b c Y U C_k e U D_b c Y U C_k e U D_b c Y U D_b a e U C Y U C_k E U D_b a e U C Y U C_k E U D_b a e U C Y U D_b a e U D_b$ UFUY_d_S__ST__^_TURUUYddQbU^U,cUb%_]_9Y_c_Uc`UbQT_%UYd_^SUct_fUbQ% QcuRQQSQ]RQbce]UYdb% fUbQceQYdWe_Ubb_bHi`_b _dQ^d_^XQRbQSQ|RY_i\QceSUcYV^U^ceS_^SY|YU^d_'DUb_S_]_9Y_cUcY]edQRUPV;UcYVYYQQ|U^dUY|`_cR(UaeUGe`e^d_TUfYcQ\TURU $\verb|cubSQ| RYQT_4`_b \& |aeU Uc\%_b Q] \& |AeU Uc\%_b |AeU Uc\%_b |AeU Uc\%_b AeU Uk_Uf U^d \\ |S_^ST_TU Q^dU |Q^_ TURU UhYd BeI Uk_aeU Cubs_N & `_cYR \& UU^U \\ |AeU UhYd S_^S M_TU Q^dU |Q^_ M_TURU UhYd BeI Uk_AEU Ubs_N & `_cYR \& UU^U UhYd M_TURU UhYd M$] sc Q_d $WKQT_4i$ `_b_ $d\Omega \cap d$ Uc $\cap USUcQbY_U$, S_ddQbY_BQTQUc] sc Y_d `_c Y_d U aeU U, $9Y_CY_B^*$ ed QR_U aeU $\cap USUcQbY_B$ $RYQT_S^*$ _b Y_Q ce $SUcYM^TU$, $\label{thm:condition} \mbox{dVJ $$$_$ aeUS_] `bu^TUd_TQc Qc S_cQc%TUcTUcYU] `bu i `QbQcYU] `bu%u^e^_% sc`ub\U5dQ% \QfYcq\u4TUGYQcbQR\u4TU]_T_ aeUd_TQce TebQ5W^$ `b_`_cYSYM^aeUcUQ%{}scSQ`Q; TUUcdbSdQTU]_cdbQSYM^%aeUcUM&b_DbUcSYL^SUTU\Qcf_\YSY_^UcTUQWL^dUc]_bQUcTUaeU9Y_cUc YS_] `Q\$R\US_^e^8_**^d\^\U**^SQTU\Ucd_c\UFU^d_c%6_] _ Uc\c\^d_TQ^\USUc\TQT4i `_b_ dQ^d_Uc\YS_] `Q\$R\US_^\Q^_S\w^Qt]\Y^Q^_T\U\Q \\RUbdQT'TUcTUcYU]`bUi`\QqqcYU]`bU%u^e^_%|sc`Ub\U5dQ%\QfYcQYQdUbQRU4TU]_T_aeUd_TQceTebQ5Yv^UdUbYQUcYndujYQRYcfYQQ% $TUUcdbSdQTU] = cdtQSfw^{saeU} cUWeb = DtUcSfU^SUTU Qc f (NSY ^Uc TU QWU^dUc) = tQUc TU aeU 9 Yc Uc YS_1 `QdR(US_^e^8 - Qd^WU^SQTU Ucd_c) = tQUc TU aeU 9 Yc Uc YS_1 `QdR(US_^e^8 - Qd^WU^SQTU Ucd_c) = tQUc TU aeU 9 Yc Uc YS_1 `QdR(US_^e^8 - Qd^WU^SQTU Ucd_c) = tQUc TU aeU 9 Yc Uc YS_1 `QdR(US_^e^8 - Qd^WU^SQTU Ucd_c) = tQUc TU aeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUc TU aeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUc TU aeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUc TU aeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUc TU aeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUc TU aeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUc TU aeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUC TU aeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUC TU aeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUC TU aeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUC TU aeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUC TU aeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUC TU aeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUC TU aeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUC TU aeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUC TU aeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUC TU aeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUC TU aeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUC TU aeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUC TU aeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUC TU aeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUC TU AeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUC TU AeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUC TU AeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUC TU AeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUC TU AeU 9 Yc Uc YS_1 `QdR(US_^e - Qd^WU^SQTU Ucd_c) = tQUC TU AeU 9 Yc Ucd_c)$] sc`\U\$U\$dQ%\QfYcdQVQdUQR\U4TU]_T_aeUd_TQceTebQ\$W^\UdU^QUcYdUb\YVCR\Y6TYQU%H_dQ%Y|e\Ud`\U\$U\$GQD_ccUccY':^\WU^UbQ\%_^_TUR\QdU^Ub]_YUT_Q @\\rundom \tu\\Qrf_\e^^d\m\ ?__^QX\Q^^: Tg\QbTc

8_b_VQY_', 'D_b_ dQ^d_d_T_c_c Q\$M\$] U^d_c TU_c Q\$J Y^Q^_c%eeU`_cUU^\Q_] ^*cSYU^SQTU9Y_c%u^S_^dQTU\QT_SdX^QTU\Q YSQ`QSTQT TU_c X_] RBLc ^_ BUMU^ULQT_c `Q\$Q\\UFQbQSQR_ \Qc S_^TYSY_^Uc TU\QcQ\$GSW^% _c] Q^TQd_c TU9Y_c Sei Qc Ve^SY_^Uc Uc`YXdeQUc% U^S_^dQTU\QT_SdX^QSQ\$fY^cQTU\QWQSQUXSQ} 4`_bUcdU]_df_%eeU UcQc T_SdX^QxQe^aeU^_ ce`_^U^Q_c X_] RBLc QUcdQbRQZ_^YWx^df_ TU BUcdXSSW^_ S_QSSW^%cY^U] RQ\$W_%ee`_^UbaeU`_b^USUCYTQT\GT\GT\GT\GUUSQUbQ, ceU_' Mcec Q\$W\ed{y} U^d_c U^S_^dQTU\Q^USUCYTQT TUf_\e^dQTUc TU_c X_] RBLc%di_ QTQTU\Q\$Q__^QX\YTQT TU_c S_] Q^T_c% b_] UcQc i Q\$U^Q_QC TU9Y_c% \QcYSUXTQT TU cec S_^cUZ_c UYfYQSY_^Uc4i_d_TQc_\Qc_RZBSY_^Uc S_^dQSeQaeYUbT_SdX^Qc TU_c SQfY^*cQc S_]_ cUbYS_] `Q\$R\US_^\Q\YRUbdQT Xe] Q^Q%_baeUY^YXBU^^\CdC ZcdQ] U^dU Ucdf_QT_cfQ^Qi_V\s__\Qx_S_]_ fYYU^T__TUU_c4cYU^T__TXXWTQS_^dQce `b_`YQT_SdX^QX\QcuS_]_ S_^dbQ\QTU_c SQfY*cdQc'

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 $\label{eq:GYCe} GYCe`_^U]_c aeU/Qc f_\YSY_^Uc TUQVU^duc]_bQuc QucdbS_^USdQT_c S_^SeQaeYUbS_cQQ^dUSUTU^d\%_^%Y^U] RQb\\\\% TURU^cub^USUcQbQc U^e^cU^d\T_dQ S_]__`QQTUBYRQb\Q\\\XUbQTGB] flj Y^\Q^Q$

8 QTQQ&d_TUVQf_\e^q\tart_oUn_cub\rangle \cdot_S\ccos_\cdot_\cdot_s\cdot_

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QRc_led_aeUfQTUQ^dUi \UcTudukj YY0%_^U,\V^TU] Q^dU^Ubce 8_^dYWU^SQQTUSeQTQi QRc_led(% Ucd_TURU.cUb`Ukj Y8f_ TUICUD` cYR\U4H TQFuQ^ fQQcUbfYbQce deb^ ' D baeUcYQf \e^dQTfYU^U^Q`QcQb` be^Q`Ub\U5dQ8 ^dr\WU^SQ% cY^ ^YWE^QSQecQU^QRc_\ed_%U^d_^SUc Uc S\Ubd %YVW\^QSd_TU\Qf_\e^dQT%YVW\^QSd_`\bUFY_TU\QJ_Q%\eU\QSQecQ%YYWE^Q TUDUB] YQSW^_\QU\USSW^TU\Q] QXQRUQ^YWE^Q`QbdU U^Uc_'@Qf_\e^dQT%_U\Q] Q%UbQTUXUSX_U\dU] QTU_ceSUTYT_Q t\` bQSSYTU^dU% Ub ^ VeU \Q SQecQ @Qf \e^dQT ^ Uc QSdf U^\Q SQecQ \Q TUdUdj YQSW^%Y^ `ebQ] U^dU U\ ceZbd `QcYf 4 $Q_{i} = \frac{1}{2} - \frac{1}{2$ S] $e^{Q}SQeQQ^{\circ}b^{\circ}QTQ4iU^{\circ}SeQ^{\circ}dQQ^{\circ}f^{\circ}e^{-\alpha}QTWMQ^{\circ}USUcQM^{\circ}M^{\circ}^{\circ}^{\circ}^{\circ}^{\circ}^{\circ}$ $TuQcUbTU dtQ]Q^{\circ}UbQDQQce^{\circ}^{\circ}^{\circ}^{\circ}^{\circ}$ $TuQcUbTU dtQ]Q^{\circ}UbQDQQce^{\circ}^{\circ}^{\circ}^{\circ}^{\circ}$ XQRUbcYT_TU_db_]_T_%Y\Qf_\e^dQT_Q]QXeRYUbQaeUbYT_%Ucce`_^UbaeUU\QSd_TU`U^TUTUe^QSd_`bUfY_TUU\USSYw^_ _bTU^QT_ _ S_^btQbY_' DUb_ Ucd_ ^_ Ucds TU QSeUbT_ S_^_ aeU ^_ dW^U SQecQ_ _bTU^Q^dU U^ QXf E eU TURU^ cUb^USUcQbQc U^ SeQ^d Q,Q] Q%aeUTU`U^TUTU ^YVK^QSd \\RbUTU\Q] Q3] Qc\ aeUUc cY^SQecQ%bc TU`U^T\U^dUTU ^YVK^QSd \\RbUTU\ Q] Q4` baeU%_b\Qce` c\S\r\%aeU^ TU`U^TUTU ^QTQ% Ucds S ^USdQT_ S ^^QTQ : ^dQ,SQc %u\Q] QcUc] UdU ^USUcQXQ| U^dUQ_aeUdbQ\Q\$SYTU^dUTU`QcQxYTUfU|U^SeQ^T_%bQ^d_\$_]_\QdUbbQaeUUcds\YQ\$dfQ%Uc_]UdU ^USUCQBQ] U^dUQ\ aeUSQUc RbUU\\Q DUb Ucd ^ S ^c\cdUS ^\Q^ S\w^Qb] \www.qbj \ww.qbj \www.qbj \ $TUdU_{0}^{\dagger} Y_{0}^{\dagger} cuU^{\prime} cec^{\dagger}_{0}^{\dagger} Y_{0}^{\dagger} cyllowed dQ_{0}^{\dagger} U^{\prime}_{0}^{\dagger} Q^{\prime}_{0}^{\dagger} V_{0}^{\dagger} Y_{0}^{\dagger} TU_{0}^{\dagger} TU_{0}^{\dagger} Y_{0}^{\dagger} cyllowed dQ_{0}^{\dagger} U^{\prime}_{0}^{\dagger} Y_{0}^{\dagger} Y_{$ \ dQ^d%UtatU^USUQ\Q8 ^dfWU^SQ6tjjY^Q^Q\TUQTU\Q\RUtatQT% cY^UjRQtW\%LcY^Sj`QdR\US^U\QAUWecdQtaQ ACUtfQb Qaeu‰eUU\QedbTU\Q:~cq_cRbU|Q|YRUbaQTTU|Qf_le~aQT%b/^9Yci\QSbQbbQ%#'0/%00'\$TYSUTU\Qc\We\U^dU] Q^UbQ @Q `QQRbQ_`_bde^%TQTcYU]`bUc%W%XSQQW_XUSX_cY^TYbUv_':\Q;Qbic_`_bdUTU\TYbUv_U^_`_cYS%v^TYbUSdQU^dbUcv%\Q ``bbe^YTQT^e^SQ`eUTU^Q`\YSQbcUQTUSeQTQ]U^dUQ\cQSdcTU\Qf\e^dQT%aeUUc\Q\eU^dUTUdTUdT_U\TYEW %aeUTYEUvQ `QtQU\UMbQWe^_aeUUcS_Wbbb%YXQ QWe^QS_^TP\$%^\&c\$Qce`UbY_bU^U_aeUcUU\WU_^4icUTYtUvQ`QtQTUbUj YQbcu Qe^QS cQ%T ^TU cU`b` ^U^T cS cQc% Ub\USdQ] U^dU\MeQ\Uc%\J\] Ub XUSX TU aeU\ XQbs';DUb QaeuQ`QbUSU e^\WbQ^ TUCSeYT_'D_baeUcY\QXQRbs\Q`bijQ`UbQTUd_T_U\TYCUv_%5_]_t\TYSU%U'd_^SUc%SUbaQjU'dU%_UccYUj`bUU\UVUSd_TU `QcQb`_bSQceQ\YTQT%cUvk^ce`b_`YQTU\Y^BYv^TU`b_RQR\YTQT'McY\Qf_\e^dQTTYcUv_c`QtQUUVVb_aeU^_U\WX%TYcUv_c `QtQTUdUbj YQbcu] Y:] %6] t\TYSU%UYd ^SUc cUTYcUvQ`QtQTUdUbj YQbd T c cec TYcUv c'@ aeU ^ c \UfQTUfeUkQTUe^ TX:Uv_Qe^TX:Uv_QYdUY_bTUTUdUt] YQbaeU9%Q_db_aeUTUdUt] YQb4i Q:uceSU:YQ] UYdUXQxdQU,YYYY<u>d</u>':.\`bi] UbTX:Uv_

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=QRYLYT_S_^YTULQT_U\`bi] Ub_aeU`b_`ec_%J\BUQSW\QaeU\Q\\RULdQTTUf_\e^dQTaeUQd] Y^Q^_c] Q^dLYU^4QcQRUL%Y dQ.S_cQXQSU%e^SQ_Xij_%Y^e^SQ`eUTUUhYdB%DQc_QX_bQQ\QcUWe^TQS_cQ`b_`eUcdQQcUb_RZUd_TUYfUcd8WQSW'%Q cQRUL GYdQ,S\QcUTU\\RULdQT cUQ\bLaeYYd_`QbQ\QQWU^SQ]_bQ%QfYbdeTi U\fYSY_%J_WY_i \QSU^cebQ%QbLs_]`U^cQi U\ SQcdW_% S'J_i QS_] U'j QbS_^e^QSYUbQS_^cYTU\QfYbdeTi \QQWU^SQTU\QWU^dU]_bQ,Ge`bU]_% \QVeU^dUTU dTQ\Q6WU^SQi \QfYbdeTi

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^_] sc f Yoole_c_%_TU \Q ^QabbQ\Uj QTU SeQaeYUbS_cQ_QR\U%aeU U\ RYU^aeU XQ; U^ ^*\W^__db_cUbaeU ^_ Uc e^Q\WU^dU]_bQ\S_]_ U\ bUc`\Q^T_bTU\c_\% \Q \Ubd\YTQT TU \Q dUbbQ\c_^ReU^_c% Ub_^ f Yoole_c_%_baeU UcdQc`b_`YUTQTUc c_^ ^USUcQbQc`QbQucd c SeUb` c% ^ U\ \Vaed TU\` TUbTU Qed TUdUdj YQS\W^

Qd fYbbe c % ce] Qj U^dU\ QR\U%CUbQY^dUbj Y^QR\U% Uc d dQj U^dUY^~USUcQbY %6] _ cU XQ^SbQT_ U^\Q\ej TU\: fQ^WUY' GUbQTUTUCUQbaeUU,9BKXXRii_db_c cQSUbT_ducTU\Q] \tdots] QS\QcU%QRuQ^Uh`\YSQT_Qcu] \td] _c%EqQ^T_XQ^QXbj QT_%aeU $\label{eq:continuity} $$ QaeUUc ^USUcQbQ%_ Uc TYWQTUU_WY4Q_1 'k'] _ dU] `_ aeUXQ^`_cUUT_ Q` UbUSSW^TU9Y_c Qt \ Uc ^USUcQbY_% Qcu%U^ \ CUMUSSW^TU9Y_c Qt \ Uc ^USUcQbY_W Qcu%U^ \ CUMUSW^TU9Y_c Qt \ CU$ `b\QQQQRQ^jQ%aeUTURU^c%W%SQbU\UZUSGY U\ducdj ^Y TU\QUcdj Q%U\buc`Ud %eX ^bQR\Ubuc`USd'MfQ^Q $S_{0}^{2} - C_{0}^{2} - C_{$ $\text{cy^U} \ \, \text{RQW} \, \text{\%aeU} \, 9 \, \text{Yc} \, \text{a} \, \text{Uc} \, \text{TW} \, \text{TU\%} \, \text{bce} \, \text{YW^YW} \, \text{ZecdSDQ%Q} \, \text{cQ^YdTQTi} \, \text{VQR} \, \text{TQT5} \, \text{GYUc} \, \text{QcWMW^U} \, \text{aeU} \, \text{cUMW} \, \text{SQecQTU} \, \text{QWW} \, \text{aW} \, \text{aeU} \, \text{CWW} \, \text{CQY} \,$ TU UhSUVJSQ`USe\YQbU^U,X_] RIBJ fY bb_c _%aeU Uc ce`bUbb_WQbfQ%U^\QaeU bUQ] U^dU d'U^U\Q`bUNUbU^SYQ4e^_S_TU TYWYTQT% $aeUUc \ \underline{d} \ \underline{dQ} \ U \cap \underline{U} \cap \underline{C} \cap \underline$ `b\ dQ^d ^ bUSYRUTU9Yc%YUc9Yc\Q\eU^dU `Qdbw^TU\Q]Yc]Q4^YeUTU9Yc%U^UcUcU^dYF %aeUUcdQbsU^S]`UdU^SQ S ^t/%5] U, RZId TUX ^ bi cU^XT 4`Ub U,X] RbU`eUTU.bUS/Q] Qbe^`USe\\QbQed.Ucdf Q%bUS] U^TQSY ^Uc% \QW(.bQ%Q\Q $aeU9Y_{C} - `eUTU dU'Ub 'Y'We'Q` bUdU'cYW' GYBY_{C} - dU'UTUbUSX_% In fYadeT TU ce cQ'dTQT ''USUcQbQ% U] U SUUS_^\QaeUU, aeUU, aeU$ $bUc`Ud_i QQQQQ]QQVbQTUSYTQYTURYT_QXX_]RbUfYbole_c_%aeUU\WWUfYboleT%U^U\UZUbSYSY_TUe^Q\\RUbolQTecbe]aeUQ^e^SY_4]sc$ aeU e^Q `YUTbQ `bUSY_cQ%aeU ^_ `eUTU UfYQbcUbTeb_ i XUbj _c_'

McYUC QCISTUZQ aeU CU Uh`\SQ_ aeU Uc` USe\YQbIUC` USd_%LC TURYT_ Q, X_] RILLI fYbble_c_%aeU cU TYKULU^SQU^\Q ^QbebQUj Qi d'_%TU QWe^Q] Q^UbQTU` ILUI] YU^SQYTU d_T _ aeU cU TURU Q 9 Y_c' o8 es\ Uc U_] RILL_\QTUCSBY SW^TU UcQ` USe\YQb QWGd_5 oGU Ucdi] Q%Qj _B%QT] YQSW^%LA X_^_B%QQQQQQ` Q_QWQTUSIJ YU^d_5 @Q: cSb&bQU^_d_TQc` QbbUc IbU` BUCU^dQQ9 Y_c \$_] _U_RZDd_] sc UUlfQT_ TU d_TQc UcdQc \$_cQc3XQ aeU\UDDTU QJ Q] QWWSGQQ, GUV_B%TU QJ Qb_\$_^d_TU, S_bQ w^% \$_^d_TQ U QJ Q%6_^d_TQ\Q) U^bUi \$_^d_TQc UcdQc \$_cQc3XQ aeU\UDDTU QJ Q] QWWSGQQ, GUV_B%TU QJ Qb_\$_^d_TU, S_bQ w^% \$_^d_TQ U QJ Q%6_^d_TQ\Q] U^bUi \$_^d_TQc UcdQc \$_cQc3XQ aeU\UDDTU QJ QJ WSGQQ, GUV_B%TU QJ Qb_\$_^d_TQ\Q U_c%Q\^] QWGY_c i] QbQf_\\(\lambda_c = \lambda_c \lambda

GYULQ ^USULYTQT aeU Q:YdU`UBUSSY_^UL i \Q: QSSY_^UL]_LQUL TU 9Y_c%cUQYS_]`QXR\US_^cUbTWYQTU U_WY_%5_]_e^Q ^USULYTQT TU \$_&&\$S\$W^4S_]_cUTUTeSU S\QbQ\UV\UY\%_Y\UBYQQ\`QbdW\N\TYSebc_TU\9B K XXRi4U^d_^SUL o`_baet TURU]_c T\QbW&\G\C\Q9Y_c`_b ce R_^T\QT%_] sc aeU cYUL&fYUbQ_R\WQT_QcUbReU^_%_] sc TU_aeU XQ; aeU QW\QTUSUbQe^_TU ^eUcdo_c cU] UZQ^dUc aeU X\SYUb_^S_^
^c_do_c RYU^%_\R\U] U^dU%_TU ReU^Qf_\e^d\QT%_TU SeQaeYUb\QR_^TQT TUS_bQ W\%Y^_TU\Q]_UbQS_QSSW^%_\Q^USULYTQT UndurcuSQS

@\\ruador T∪\Qrf_\e^qdor ?__^QX\Q^^: Tg QbTc

 $EeUVQfYbbeTTU9Yc ^ Uc%u^VU, cU^bT_] sc QTUSeQT_%bS_] `U^cQRUW^_Uc `_bVQbQTU] tbd_U^cec `UbUSSY_Uc i VQc QSSY_Uc i Vac QSSY_Uc$

GUSSYu^≯

@ c QSd_c TU\Qf_\e^qDTTU\Q] QXe]Q^QTU?uceSbbcd_%usucQbdQurda%ub_fubTQTubdQurdaQurdaE_c_%now_TUQQRQ^jQ% BuS_1`u^cQR\U%S

 $-*) '\$MTU `b_] \ UcQc \ i \ Ql \ U^Ql \ Qc\%' + 21\%) *\%) . \% **\%, 2\% -) \%/, '\$MS_] \ \underline{b} \ UaeYcYd \ `QbQe^UcdQT_TU `beURQ%' + 20\% \ ! S'$

6X_b0%_b_d0^d_%6_^e^_Z_QUcdocs_cc;\(\) U WecdobaQ \cdot \c

@\\#Uadot \to\Qr_\e^dot \rightarrow\Qr_\e^dot \rightarrow\Qr\. Tg\QbTc

 \Rightarrow : $bQY_1 `_cYR_1U\%_aeU_cQEd_cTU_Qf_e^dTTU_Q_1QXe_1Q^QTU_8bCd_TURU%U^SeQ_aeYUbSQc_%WQT_%_SYEe^cdQ^SQ%Cub_1sc$ $aeUcQ^d_iQWQTQR_1UQQQ^QebQ_UQTU_9Y_ci_Qf_e^dT_@cc_cWeYU^dUcS_cQc_XQSU^TU_Ucd_UUYYTU^dU^S$

*'9YcXQRuQ`b]U8T dQ^UXSQj]U^dU`QtQ`bUcUbfQbiXQcdQTUdU^Ub,` bce:c`ubXb%U^dTQccecdU^dQSY^Uc%aeU ^ `TuQVQ\QbTU\W^`QbQU\aeUXQfU^TQ\]e^T 4`Ub XQRbQVQSQcQT %cYXeRYUbQSQtT U^U\`USQT'HU^U] c`b UZJ] `_e^Q`b_] UcQ%#&L@>> &-'''\$ =U Qaeu] YcYUUf_%QaeYU^c_cdU^W_4] YUcS_WIT_%U^aeYU^] YQJ QcUTU\UXQ8=U `eUcd]YUc`ubdec RbUt\3t\dbQUbs ZecdlSQQ\Qc^QSY^Uc3B_SQ]Qbs%YQjQbs%YXQbs cefj`QbQcUbUcSeSXQT_U^ U, cdbud&GU` ^Tbs^ZeYSY ceSucYQ] U^duQf UbTQT' B cUSQ^cQts%YTuc] QiQts%XQcdQaeU ucdQR\UjSQU^\QdUbbQ ZecdSQ4i \Qc Yc\Qc Uc`UbQbs^ce \Ui';: cdQ`b] UcQTU\: c`ubXdeTU9Yc`ec c RbUt\% ce^ Ucds\\ bQYT i \UfQ^dQYT cef;% $S'cUlbUQSY^QS^U]$] $U^dTU^QQ^QbSW^TU8bbbdU^QbbbW^S$] Uc] $Q^MWbbdQ^Q^QbbBW^TU^Q$ ^QuebQUi QTU\Q`b] UcQ% dQ] RYE^\QQ`\YSQS\w^TU\Q] YE] QU^U\BeUli HUcdQ] U^d \%# A QddhYY*1'\$M\Qc`\QQRbQc 'ij \'\SQ^e^Q\`b] UcQTUce] T TUcUbS ^\Xtg| QTQ\` bU\: c\`ubXteTU9Yc\%aeUTURUcUb\`bUcUtfQTQTU\\` USQT 4 W(bQTUUcdU] e^T %Q`] `QTUe^`burSYUdUbburQ% U\Q`\Qec i W(bQTU\cX] RbUc4i aeUt\TURUcUb` b\ S ^XIG w%aeUTU^YW&^Q] Q^UbQTURUTUZQbTU RdU^YU^T Q\W^Q\TUce U^dbQTQU^\U\] e^T %TU\\UfQbQfYSd bbQU\ ZEYSY % U, UcdQR/USY YU'd TU ce BUY` TU /Q WKQSQ U^\Q dXUbbQ M U^\ c cYWEYYYdUc f Utac c%UcdQ`b] UcQcUS_^Wbj Q%S_^ \Q] Qi bc \U] ^YTQT Y] QM^QR\U 6cuTYSUU\GUv b%U\aeU SbUw\ cSYU\c% U\aeU\ cTUc`\YUMQ4U\aeU UhdbY*TU\QdbUbQ% i\ aeUcQUTUU\Q4U\aeUTQQ\U^d Q\`eUR\ cRbUU\Q%iUc`ubXbeQ\ caeU` bU\QQ^TQ^3M ?UX fsdUXU\\Q]QT U^ZecdSQ% c cdU^Tbs de] Q^ 4i dU WeQbTQtt% dU TQtt ` b`QSd Q\`eUR\ % b\ej TU\Qc ^QSY ^Uc% QtQ QRbb\ c Zc SYLW c% QtQ aeU cQaeUc TU \Q SstSU, Q\ c`tUc c% \ c aeU XQRYtQ $^{\text{L}}$ U\Q cSebTQT \eUtQTU \Q SQcQ& bbCYw $^{\text{L}}$ M ?UX fs% aeUUc]Y^_]RbU%ud5"

A ei `QtQ\U_ S_^Ucdc` b_] UcQc Uc_dtQ?##e' L@L' 0%1.%2\$aeUdQ] RYt^dtUr'U erQQ`QtUrdU buc` Usd_Q\
dtU] `_TU\QXe] Y\QSWrTU8btcd_Ur\QdtUbtQ'&6cuXQTY\$X_?UX_fs%FUTUrd_bTU zebQU\% ce GQrd_er_%Q\
] Ur_c`buSqT_TUQ] Q\%aeU\UTUc`buSqQ\QrQSWr%Q\cYUbf_TU_c W_RUbrQrduc4J Ubs^bul Uc% cU
\UfQrdQbs^\bussYUc QT_bQbs^4`_baeUTU\GUv_baeUUc \YU\%U\GQrd_TU zebQU\% U\SeQ\dUcS_\WW 6cuTYSUU\
GUv_b\hur\er^dtU]`_QSU`dQR\UdUXU_uT_4Ur\er^TuQTUcQfQSWrdUQieTt4i dUWeQbTQbt% dUTQbt`_b`Qsd_Q\`eUR\ % QbQbucdQebQb\QdtUbtQ\; 'S'

$$\label{eq:municonstraints} \begin{split} \mathsf{MU}^*&=& Q.\) 3. \text{ %' } \mathsf{HU}^*\mathsf{U}_1 \] _c \ \mathsf{U}_1 \ \mathsf{A} \ \mathsf{U} \mathsf{C} \mathsf{Q} \ \mathsf{U}_1 \ \mathsf{U} \mathsf{C} \mathsf{U}_2 \ \mathsf{C} \mathsf{U}_2 \ \mathsf{Q} \ \mathsf{E} \mathsf{U}_2 \ \mathsf{Q} \ \mathsf{U}_2 \ \mathsf{Q} \ \mathsf{E} \mathsf{U}_2 \ \mathsf{Q} \ \mathsf{U}_2 \$$

 $2'\$ \ D_baeUt\ ^_XQRuQXUSX_fY_U^SQ%YcUXQ\wU^WQv_U^ce R_SQ; GYUc `_cYR\U%aeUUcd\cc`b_] \ UcQc TURU^VQ\cappa_0 \ V\cappa_0 \$

 $^{- &#}x27;H_TQc /Qc `b_] \ UcQc \%eU cU XQRUQU du MQT_ `_bU, `b_WUQA QQeeuQc Uc` USds Sel_ \\$ `QTUUC U^U, `QcQuc_\QQ_ aeU cU XQRUQU du MQT_ `_bU, `b_WUQA QQeeuQc Uc` USds Sel_

 $aeUcUQN] `_cYRNU aeU8bCd_ ^_TURUbuQXQRUb` UbcUFUbQT_ U^` UbSUScQ cQ^bTQT' @cc Q^bTQF @cc Q^bTQF &cc ` bUTYSSY_^Uc TQTQc Q_VQYMUcYQTU 9Y_c% TU, A UcuQc S_] _ e^GQxFQT_bYAbbQ^TU_VQ^QbbQVJ QTU_VQc ` b_] UcQc4S_] _ Uc UFYTU^dU `_b_c ` b_`Y_c ` bUTYSSY_^Uc% VQY_bJ QTU_VQ U^bUMQTU_UN_c' DUb_ c_^Uh` bUcQJ U^dUi] ei Q] U^eT_ \\QJ QT_ ` b_] UcQc U^U\ BeUf_ HUcdQJ U^d_4#8_] _ U^@sQc Y. - %. %0+% 0, ' =USX_c h\m^r, +\%, 'F_] '$

i'*&,'iSQ'hf'1'=U]>*,%iS\$:cdQc`b]UcQc\eUb^XU5XcQ]U^eTS^W6Q^c\U]^MTQT%icUS^W6]Qb^S^e^2ebQ}U^d'4S] % $\#\text{U}^* \text{ Inh} \#*/ \%0 \%0 \#\text{D_D} \text{ u} \text{ i.e. } 2 \text{ with } 2 \text{ with } 2 \text{ i.e. } 2 \text{ with } 2 \text{ with } 2 \text{ i.e. } 2 \text{ with } 2 \text{ i.e. } 2 \text{ with } 2 \text{ i.e. } 2$ SYL_% S_] _ U, QtU^QaeU Ucds Q\Q_bY(QTU,] Qt3&i U^de c\] YU^dU d_TQ; \Qt ^QSY_Uc TU\QdUbbQ cUts^RU^TY(Q; #S_] `Qtqb@eSQc Y0+%b, 'i <Q\ >>>1%. %/ ''''\$\\,Q`\\cd\\U^=\UR\\U_c'] >*0%1' XQR\QDTU\\\cd\\D_] \\cQQ6R\\QXQ| %7\\SU3: ^T_\TU9\'_C ae\\U\\D] \\cd\\D_] sc Q\Re'\TQ'\U\] U^\d\Q _c XUdUTUb_c TU\Q`b_] UcQ\QY] edQRYATQT TU ce S_^cUZ\%^dub`ec_ ZebQ| U^d_4aeU`_bT_c S_cQc Y] edQR\Uc\u\^\Qc SeQUc Uc \j|`_cYR\U aeU 9Y_c] YU^dD%dU^WD] _c e^V_bdlcYj _ 5_^ceU__';: ^aet `QQRbQc%Q^U5UcYTQTTU\Q!bUQYj Q5W^%_ #_aeU Uc_] Yc] _\$\Q\j `_c\n\YTQTTU_ S ^dtgbt'%lucds d dQj U^duTU5\QbQT '6cuaeU9YcS ^Vtg w\Q`b] UcQTU\QVtQ^cQfQ5\w^TU\AUcuQc%\U5XQQ9QfYf\% be^ZebQj U^d 4# DcQ\ @LL12, %'\$ =UXUSX_e^`Q\$d_S_^] YUCS_WIT_%VUZ\$DQT_Q9QfYT] YCYUUF_4de TUCSU^TU^SQUcdQR\USUb`Q\$QCYU] `bU% UTW6Qtr de do_^ `_b d_TQc/Qc WU^UbQSY_^Uc';B__XQi_^QTQ.dQ^^QRe_^TQ?dU] U^dU.cU.UcdQR/USU.U^\Q; cSbbbbQ%Q^cUWeb_i `bbbedQR/U9% QaeU.UcdQ` b_] UcQi ZebQl U^d_ Q9QfYT#UbGQ]_@LL½,-&'''''',/'+GQ|hhYYK.'>eQVf-'@cQsd_cYY+2%)'i,-'hYY6@Q:cSb&ebQXQR\QUh`bLcQ|U^dUTUU\QS_]_ QRc_\edQ] U^dU^j `_c'R\UaeU Ucd\`b_] UcQi ZebQ| U^d_Q9Qf\T%\I^bUQSYw^S_^U,T_] Y^Y_UdUb^_ TU,AUcuQc%TURUVQ\Q\$ #Ub' LLL>>>*. % S'\$: ^QaeU\\ c TuQc% U^\UcU]] U^d %aeU XQbs aeU \QbQj QTU \QZecd6QQSbUSUbQ9QfYl &D baeU QcuXQTY6X ?UX fs3B \QxdQbs Q9QfYl fQbw^ aeU cU c\U^dU c_R\U U\ do ^ TU \Q SQ:QTU ztQ\\ # Ub+) %**\$ GYcU`eUTU b_] `Ub] Y QSd_S_^U, TuQi] Y QSd_S_^U, aeU ^ XQ QT\Q $\Upsilon^SUQcedU]$ _4QS_ $\Upsilon^QCWWD]$ RY ^ eUTU YFQXTQb] Y QSd_S_^] YCYUUF_9QFYT%aeU ^_TURUbQdUYUbXYZ_aeU UUYUC_RUUce UTQT U^bU\Q5\\^S_^\Q\WQ^cQf\Q5\\^i U\bU\^_ TU\A UcuQc TURU\Q\\Q5_aeU\j_\'\\SQ%aeU UbQ\j_`_cYR\U aeU UcdU 8 bbcd_%U, cUWe^T_ 6Ts ^%Q $\textbf{c'}_1 \textbf{VL}^{\text{U}} \cdot \textbf{b}_1 \textbf{W}^{\text{TQTU}} \cdot \textbf{E}_1 \textbf{V} \cdot \textbf{C}_1 \cdot \textbf{TU} \cdot \textbf{Q} \cdot \textbf{Y}^{\text{TQTU}} \cdot \textbf{SQL} \cdot \textbf{TU} \cdot \textbf{Q} \cdot \textbf{C}_1 \cdot \textbf{V} \cdot \textbf{Q} \cdot \textbf{C}_1 \cdot \textbf{C}$ `Q&d_S_^\Q^_SXU% aeU^_XQ;QTvQ^Y^_SXUQcedUJ`_4QS_^dheQSW^%tD;RYL^`eUTUY^FQ\YTQb]Y`Q&d_S_^]YcYUbf_9Q`YT%aeU^_TURUbxQ $dU'UbXZ aeU bUYU c_RbU ce db_'; \# ScuaeU U'U, f Ub +: \% + \% + \ D_b \ dQYd_Q Re^TQYdU Uc QC cSbdebQ U'Q bU bUcU^Q bW^TU \ Y_i `_cYR\U aeU UbQ%$ $aeUV_Q`b_] \ UcQc \ XUSXQc \ TU \ UTQT \ U^bUQSW^S_^VQ \ WQQ^cQW QSW^i \ U, bUY_TU, A \ UcuQc \ TURU \ VQ/QbSV_ \ aeUV_J \ `\SQ%aeU \ UbQV_J \ `_cYRU \ aeU \ UcdU$ 8 bbcd %u, cu/we^r 6Ts ^%Qc/j Yu^du`b] udfrqTu6RbqXQj i Tu9qfYfY9TURUSQubTUce YYdUMbfTqT%5] \Q`bij ubq6Ts^Xij '\$ GYcU`eUTU] YCYUIF_9QfYT%aeU^_TURUbQdJ^UbXYZ_aeU!bJ^Uc_RbJ.ce.db_^';#5cuaeUU^U\fUb+.%#/'\$D_b_dQ^d_QRe^TQ^dJUc\Q: cSbbbbQU^\Q $\begin{tabular}{ll} \textbf{kULU}^dQSW^TUV_M^T `_c'N; U aeU UbQ%aeU VQ `b_1 UcQc XUSXQc TU UTQT U^LUVQSW^S_^VQWQ^cQf QSW^1 U, \buy_TUV, A UcuQc TURU VQ; \busiled BaeU \cdot \cdo$ 'ij`\\\$Q%aeUUbQ\ij`_cYR\UaeUUcdU8bbcd_%\uk_cW\e^rt_6Ts^%\Qc\ij`Yu^du`b_]UbfiQTU6RbQXQ]iTU9Q;YfY%TURUSQUbTUceY^dWbffQf%6_]_\Q`bijUbQ6Ts^X\j'_'

@\%Ubd\T\U\Qf_\e^d\T

 $$$ \text{TURU VQVQ5}_b = 0.50\% \text{ We U XY}_$$ \text{USUCQY}_b = 0.80\% \text{ TURU `UbcUf UbQbi} $$ \text{dbRQDQbbUQ}_U \text{UQ SQR}_VQ cQf QSW^ `QbQ ^c_db_c% aeU ^TURU VQVQ5 _bVQ S_] $$ \text{YW^TU, `USQT_'} $$$

V bZQT QSQR ` b8b/cd'M`eUcd aeU#S] U,Q/JYYQ^ccuU^tb/MSQ]U^dU]Q^dU^Ub\$e^TUSbUdTU9YcY^WbUJ

2' E EUTURUBROCUS, _CRIU aeU 8BYG TURUTU XOSUSQI CUMED %C TETOXIBO JI , _CRIU aeU ROJI , _CRIU aeU ROGI TURUTUZDTU XOSUSQI QAQ

2' E EUTURUBROCUS, _CRIU aeU 8BYG TURUTU XOSUSQI _CRIU AEU ROJI , _CRIU aeU ROJI , _CRIU aeU BOGI TURUTUZDTU XOSUSQI QA EU UTURUBRO CUS, _CRIU aeU ROJI , _CRIU aeU RO

)'GYULDQ` cYR\U aeU 8 b'.cd XQ^VLQSQcQT U^XQSUb\Qf \e^dQTTU ce`QTLUY& QcuXQ^VQ\QT TU ddQRQLQbUXSQ;]U^dU QSQR \Q\bUTU^S\w^TU_c`U\$QT_bUc%U^d_^SUc\\QcQfQ\$\w^TU_d_T_c_c cQ^d_c%\eU\\eUb_^cQfQT_c TUcTUU\`b\^\$Y`Y_TU\] e^T_%Q VQ] eUtaUTU8bićd %° cUS ^catei wc RbUe^QRQcUVtf] U':\AUcuQci \QbUTU^SYw^aeUYRQQatQRQZDb` bce RUTYU^S\QXQatQ $\label{eq:condition} $$ Q = U d V e Q U Q E$ HUCOD] U^d dU^uQ^U,`UbTw^TU cec`USQT ciU,\QC bTU9Yc% \QcQfQS%^\UcS ^\Xbw`b] UbTQ%dTQfuQUbQ` c\R\UaeU U, A UcuQc%6eQ^T \\UWW% TbQS] UdUb`USQT %L/d ^SUc d T Ucd UcdQRQU^e^QVe^TQSW^aeU ^ UbQVdj Ui UcdQR\U% Ub cecSU`dR\UTU] QAQW_aeU\eU`_cYR\U^e^SQ`_TbQcUb 9Y_c XY_`_bQcuTUS\b_S_^XQ^; QQ_aeU ce XY_cU XQRuQ S]`b]UdiTicUS]`b]UdiwQXQSUbU^U,\edeb%iTU`U^TuQ]eSXcRbUU\Q%aeU`bSUTWU^bUQ\YTQT`QtQcQfQbQ\c X.] RbUc U^\QSeU^qQTU aeU%Q` UcQbTU aeUi Q cU XQRuQ XUSX ' DUb UcqQS_^WQ^j Qi TU` U^TU^SQTU 9 Y c%U^\Q ce`cYSW^TU8btd TUcUbbUc`^cQR\UTUXQSUbaeU\VQ\U^cef\e^dQT%eUQ`iQT U^e^RQcdw^aeUUbQTtR\%% `cYR\U]U^dU%ThuQ^b]`UlcuU@ccQ^dcTU\QQ^dKNyUTQTTUS^WQ^jQU^\Qc`b]UcQcTUe^QVedebQbUTU^SW^QcUb V bZQT_iS_]`\UxQT_`_bU\AUcuQc% S_^cobeiUb_^ceS_]_TYTQT c_RbU U\Q86RbQXQ| fY_U\TuQTU8bcd_% cUbUW_SZ&4i_t\i _c_dbc`QdbQt5Qt]ebkwU^\QVUTU\Q`b]UcQTU\Q]Yt]Q%#=URbU_chY,'''\$GY^U]RQbW%U^UcdUce`eUcd%ce VLMce S] TYTQT i ce cQf Q5Yw^9&eUS ^cobeYt c RbU e^Q RQcU VQ\P\Uc48 b/cd ^ UbQ `QbQ U\\ c e^Q `YUTbQ `b RQTQ%TU SY] YU^d UcdQR\U4;#e*/ LLJ >> \$9QFYTU^dubQj U^dUTUcSQ^cwU^U,`QSd_TU9Y_c S_^t\%U^bUQSW^S_^U,T_] YY_\edeb_W_bY_c_i \QcQfQS\w^TU\AUcu\cdl`YZ aeUUt\QdTQcecQeT%dT ceTUcU4icUS^ceU\QaeUUcdU`QsdUt\Qe^`Qsd`Ut\Ue\% _bTU^QT_U^dTQc\QcS cQc% cUbs%#+GQ| hh\\\."\\$DUb cY\Qf\bobTTU8bcd `eUTU\Q\Qb%cUXQRvQUaeY SQT 3ceWbQ^ S_] _TYTQT ^_ cUS_^cdtei wTU] Q^UtQ cUMbQ;] YU^dtQc `U^cQRQaeUUtQ%YU^T_ Ve^TQTQ`_bS_] `\Ud U^\Qc TUDUB] YQSY_^UC TU,\\RUJQRUTBU_TU,Q] QXe] Q^QTU8bCd_4aeUUcdQRQceZUd_Q^YV\&^Q^USUc\\TQT%_TbQTUDUB] YQbCU iQcUQTUe^]_T_e_db_'HQ]RYL^\QTU`U^TU^SQTU`QaeU_caeU_Uc`UtQRQ^\QbUTU^SYw^U^?UtecQtL^% \Q]U^dw\Q $S_{c}^{0} = C_{c}^{0} = C_{c$

**':\X_] Rtu 8 btd_?tuxc%p^duc TuaeUt\XQRupdubj YQT_ce Sebc_TU\Q_RUTYU^SQ% cYRYU^U^] UTY_TUdU^dgSY_^uci `beURQc% UtqQRe^TQ^duU^\Q`buT5SW^`_cY8fQj U^du ce`b_`YQWLbQVedebQU^ce btM_% \QQj \\QSW^TU ce YMucYQ%QcQbfQSW^TU\Q WU^dMuc`_b] UTY_TUt\% S'i U^\Qc`b_] ucqc TURU^TYSY_^uc aeU YRQQ_d_bWqbQcec fUbTQTUb_c TYSi e_c U^ce Vedeb_bu_4U^\Q aeU`b_] udu aeU btaeYbtu\QTU U^TU^SQS_] `\udqTucec TYSi e_c% _c TYSi e_c dU^TbuQ^^YWk^]_df__TUTYSQTU U^TU^SQ% cY8 btd_XQRbuQ^cYI_cecSU dR\UTU VQ\QbU^ce dtQRQZ_#eQ^hY '\$i U\] 'c] _ 8 btd_XQRbuQ^cYI_SQ4fUbR\WqSQ \Qc Tudubj YQSY_^uc TUce\YRbuQRe^TQU^`b_] ucqc 'ij` UtqqTuc S_cQc%aeUTU`U^TuQ^TUe^Q] utqS_^dYWb^SQ4fUbR\WqSQ \Qc Tudubj YQSY_^uc Tuce\YRbuQRUTbu_%aeUS_^cYcdUU^e^Q\YRbuQT QT e\be] aeU%

Q,`USQT__\QcQ^dfTQT%TU`YUU^\QY*TYUU!U^SYQ%JYSYTU^dUc%J^]YUcTUSQc_cVedeb_c%QcUQ`QtQYbTUe^]_T_e_db'

@\\rutator T∪\Qf_\e^ntor ?__^QX\Q^^: Tg\Q\$Tc

 $$$ \parbox{\parbox

DQbQS_^cYTUbQbcY8 bbcd_%U^ ce S_^TeSdQcQ^dQU^\QdbbbQ%_b_ dQ^d_ ^_UbQe^QWU^dU]_bQ%ceZbd_QwbTU^Uc% b_] UcQc%
LKG'

, **'\$DUb_\QS_cQaeUUcdUUcSbblbQXbl_QXbL_TU|_cdbQR\U]_U^dU\Qc_%cY\QbU\XXXV^SbbcbQ^QUc_SYbbd_'GYXQ_QW_TU f UbTQT U^U, SbcdQ^c] ___ \Q GQNbQTQ: cSbdebQ%U, X] RbU 8 bcd_? Ucxc def_ ce f_\e^dQT Y^Q\R\U U Y^Q\dubQR\U] U^dU TUDUBJ YQTQQ,RYL/% aeU` bcuc \Q4`Ub Qx^dL/uQ`b] UcQcTUBLS]`U^cQc W BY cQc XUSXQc Qt\%6 ^\QS ^TYSW^ TU ce `UbcUf`UbQ^dUi `Ub\USSY ^Qb\Q RbQaeU9Yc\UXQRuQTUc\WYQT 4#e'@\WY*) %*%+! DcQ\'\XMSh'xeQ'L\Yh'0%L%2'\$: ^@sQc hh\\ +1\%)'8btd_T\\$UQ\cT\\$Sùe\c3]_c_db_cc_Y:_caeUXQR:Y:\Udj_Q^U\$\T_S_^]\\ U_U^]Y:\beURQ:4i i cQcYW^e^bU^%6]]YDQTbU]U\QcYWYwQ]u;@Q`QQRbQcYWYW6Q]scQTUSeQTQJU^dUQTUcYWYQb`bU, `Q&d__`b_] UcQ:\S\Qb_c\\Y\Y\X\$QT_TU\Qc`Q\QRbQcTU8b\cd_Uc\Qc\Y\\\Y\^dU36]UT\TQaeUXQ^`Qb\d\$YQT_TU]\c dU^dQSY_^Uci_`beURQc%; XQ.cYT_VKG_U%; XQRUbce`UtQT_4Db.]_Ud_XQSUbaU_`QbabY_Uc_TU.]_YbUS_]_`U^cQ%; `QbQTQbU.e^ $\label{eq:local_control_control_control} \businesses $$ LUY_48_] = U_1DQTLU_1UXQ`b_1UMT_e^LUY_^QQS_^dPeQbVM_Uci_Qce`UbQSW^TU_Uc_cU^cQ_c';MQc`QQRLQc. $$ QQRLQc. $$ All $$ LUY_48_1 = U_1DQTLU_1UXQ`b_1UMT_e^LUY_1QC. $$ All $$ A$ $c_^RYU^Uh^YSUUH^YSUUH^YSUUH^YSUUH^YSUUH^YU^SUUH^YU^SUUH^YSUUH^YSUUH^YSUUH^YSUUH^YSUUH^YSUUH^YSUUH^YSUUH^YSUUH^YSUUH^YSUUH^YSUUH^YSUUH^YSUUH^YSUUH^YSUUH^YSUUH^YSUUH^YSUUH YSUUHYSUUH YSUUHYSUUH YSUUH YSU$ fU^SYT_%;]UXUcU^dQT_S_^]YDQTbUU^cedo_^';M8bcd_^_cw_XQRuQ`b_]UcQcTUthYd_W(bYc_ibUs_]`U^cQc $XUSXQc\ Qce\ _RUTYU^SQi\ ceVbi\ YU^d\ c\%\ Ub\ \ VQc:\ cSbbbbQc\ SVQbQi\ U^dU\ \ bU'\ bUcU^dU\ S\]\ \ Ub\ ec\ TU\ UcdQc\ \ b\]\ UcQc\ \ \ b$] df cUYSU^df c RUTUSUbi ceVbb4i U^`QbdSeVQb/Q`b] UcQTUe^bU^ aeUU,DQTUU,VQRvQTUcYWYQT % cU^dQT S ^U\DQTbUU^ce ob ^ 4#8] U^ =URL≯*%+'\$ TUc` Z[] ^ c TU d T `Uc i TU\`USQT aeU ^ c b TUQ% S bbQ[c S ^`QSYJ^SQ\QSQttlubQaeUdJ^U] c` bTU\Q^dJ% eUcd c\ c Z c U^?Ucxc%J\ Qed bi S ^ce] QT bTU\Q\VJ4U\ SeQ\` b U, Wj_`eUcd_TU,Q^dUTU.t.\%c`_babv\Q.Sbej %}_U^_c`bUSQ^T__U, `b_RY %_cU_cU^abv_Q\QTVLcdbQTU, db_^_TU.9Y.c';

9 U QSeUbT_S_^UcdQT_Sdb^Q%ucQSbQdebQaeU Ucds`bucU^dQT_SQbQ] U^dU U^\Q: cSbdebQS_]_U\`bd]_Wt ^d_TU d_TQSbQdebQ%6_]_
dU^YU^T_U^d_TQc \Qc S_cQc \Q`buU] Y`U^SQ% S_]_U\] sc Qd_TU d_TQc \Qc SbQdebQc U^\QfYbbeT%u\X_^bi \QTYWYTQT TU\Q
Qed_Ucddf Q%QQRQ^j Q% WL_bQ%QSQecQTU ce fYbbeT%uc] U^_c TYW_TU`buJ Y__QQRQ^j Q%aeUU\] sc \UfUTU_c cQ^d_c4cu%_] sc
TYW_aeUe^bu_Z_e^cf_1`\U] saeYQ%aeUUc`ebQ} U^dU`QcY_%]_fYT_`_b\Q^USUCYTQT ^QdebQ\

6 Zej WQb`_b\Qc kb' kbcu^qQsY_^uc TU\Qc UcSbakebQc TU\Qc S_cQc%bU^U]_c kQj__^uc `QtQce`_^ub%aeU 8 bcd_d] wc_Rbut\^eUcdbQ

^QaebQQuj Q% XQRYaWs_^^_c_do_c U^ucdu] e^T_%bV^e^\ucdqT_TUceVaj Yu^d_%_cw__`QtQcQdcVQsub`_b^eucdo_c `UsQT_c4` Ub_aeU%Q

UcdQbU^^eUcddQ ^QaebQQuj Qi SY5se^cdQ^SYQc% RQZ_^eUcddQc `beURQc%_TbaQcub^eUcdo_uZd] `_] sc QTUseQT_i Q`b_`YQT_%bTUbi

SQ`Ysk_^kb_^u_u_uZbbsYsy_TU\QfYabeT W_bY_c_i fYsd_bY_c_% `_TbaQcube^uZd] `_ fYxRvUTUVYQ_W_bY_c_i kbs_] `U^cQTUUVQA`QbQaeU

`_TQ]_c fUbU^t\\QRU\Uj Q%Qj YQR\U^ucc% fUbTQTUb_X_^bi \QW_bQ% ce`UbY_bQRU^uVSY_%TUUCQfYabeT%aeU uc QTUseQT_ `QbQ

^c_db_c_c cUbUc Xe] Q^_c Q\Q`bsSd6Q4i `_b_dQ^d_`_TbaQQ`bU^TUb% cUbQ^J QT_%QRecSQb\QW_bQi U\X_^bS_]_% `QbQ_Rdb^Ub

\QBUS_] `U^cQW_bY_cQcJj YQbUc' # Ub=UR YY2 & *-' S_^f 1%2' i hY**%#%

$$\begin{split} &9Yc\ XQR(QTUcu]\ Yc] = S_{1}^{3} \ USe(YQ) \ U^{3}URV^{2}CQSCVSS_{2}^{3}(QZCQSSQTUUCcUTYCOVVST_CYBYU^{3}UW^{3}UUCUTYCOVVST_CYBYU^{3}UW^{3}UUCUTYCOVVST_CYBYU^{3}UUCUTYCOVVST_CYBYU^{3}UUCUTYCOVVST_CYBYU^{3}UUCUTYCOVVST_CYBYU^{3}UUCUTYCOVVST_CYBYU^{3}UUCUTYCOVVST_CYBYU^{3}UUCUTYCOVVST_CYBYU^{3}UUCUTYCOVVST_CYBYU^{3}UUCUTYCOVVST_CYBYU^{3}UUCUTYCOVVST_CYBYU^{3}UUCUTYCOVVST_CYBYU^{3}UUCUTYCOVVST_CYBYU^{3}UUCUTYCOVVST_CYBYU^{3}UUCUTYCOVVST_CYBYU^{3}UUCUTYCOVVST_CYBYU^{3}UUCUTYCOVVST_CYBYU^{3}UUCUTYCOVVST_CYBUUCUTYCOVVST_CYBYU^{3}UUCUTYCOVVST_CYBUUCUTYCOVVST_CYBUUCUTYCOVVST_CYBUUCUTYCOVVST_CYBUUCUTYCOVVST_CYBUUCUTYCOVVST_CYBUUCUTYCOVVST_CYBUUCUTYCOVVST_CYBUUCUTYCOVVST_CYBUUCUTYCOVVST_CYBUUCUTYCOVVST_CYBUUCUTYCOVVS_CYBUU$$

 $\label{thm:cy_xQR_Q} $$ M_{Y^*} XQR_Q = U_{Q^*} U_{Q$

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 $\label{thm:complex} \begin{align*} Tutul_c \end{align*} $$ \text{Tutul}_c \e$

 $0'$ = Qc Q[QT_VQZecdSQi QR_bbbSYT_VQ] QTQT4`_bV_dQ^d_9Y_c\%b9Y_c\%bUXQe^VXYT_S_^UV_wU_TUQUWMQ] sc aeUQ dec S_] `QvUb c_'$

B XQ Uc`QSY`QbQVYYW8%aeU\cRUYUVISYcdbWQTcVV(bYccS] S ^cUSeU^SYQTU\Q RUTYU^SYQTU8bicd% ^ c ^`b`YQ]U^dUTU\Q^QdebQ\UjQTUe^QbUS]`U^cQ'oEetUce^QbUS]`U^cQ%U^U,cU^dfr]sc`b`Y% $\label{eq:constraint} \text{cy_e^RU^UVSY_d bNQT_QS_cUSeU^SQTUQW_]_bQ} \text{ Undu UhSU,Undu U^SQ,YTQT_S_] `_bdQ] \ \text{Yund } \text{Wune^}}$ ducdj ^Y TU, RYU^RUQddeT U^aeU\QUhSU,U^S\Q] bQ,i TU.buc`Ud i QWbQT Q.UcQ.SeU^dQ5 GYdU^U] c U^SeU^dQ \Q^QdebQ\UiQTUe^QkbuS]`U^cQ]scUcdb6dQ]U^dU% XQSUbU\]shij TUU\Q% QvQTrijcQ\ aeUUcTUUcdQ $TUCSDYSW^{1} t bdd^{b}_{1}^{b}_{1}^{2} = 1 t bdd^{6}_{1}^{6} QS_{SUCW}^{T}U_{c}^{T}U_{c}^{T} RU^{2}UWSY_{c}^{S} = 1 S_{C}USeU^{S}QTU_{c}^{Q}_{b}^{D} UcQ4H_{c}^{T}QT_{c}^{T}QT_{c}^{D}$ cU`eUTUU^S ^dbQ\%^ XQi ^QTQaeU\U`UbdU^USU% Ub \ aeU\Q: cSb\debQ\QbRei U] sc Uh`bUcQ] U^dUQ\QW(bQ d bMQTQQ8bxcd %Tuc`et c Tu cec ce\bij Yu^d c48] cu Tuc`bu^Tu Tu\ aeu XQcYT i Q Rcubf QTQ4XeR e^ RUYUNSY dibinqt wij bir cquins nouseunsyqtu qw] bqj undu uhsujundu%gvunt ivoj qtq @busddet i vq RUTYU^SYQ4XeR WIQ^YQF I3%U,Q] bi RYU^`\UQcUT^Ucc% bUcqQzecdGYQi RUTYU^SYQ%U^U,aeU dI3WQ4^ XQRuQ] tbd `b`Y%YcUQTYW^ TU\Q`bUcdQSW/%U^\Q RUTYU^SYQ4aeU\eU d bWQT U^Se]`\\j\YU^d TU\Qc`b]UcQc XUSXQc`QbQaeU\Q RUTYU^SYQ4i \euS ^SUTYT % b\ dQ^d % ` baeUt\XQRuQ\bUQ\YQT aeU\Q RUTYU^SYQ UcdQT TU`beURQ':\x\dj 6Ts^%6] 8bcd cU\\Q]Q%#8 b'Lf'-.'F]'J'*-'\$dU^\U^T c RbUt\\Q ^QdebQ\UiQXe]Q^Q%` b\ aeU\QS ^TYSW^TUUcS\Qf % UcdQbRQZ\Q\Ui%TU`YUiQSdeQb` b^ c db c%cU`ec U^e^UcdQT TU`beURQ%6] U\`b\jjUb6Ts^gQc'&9b'

@\\rundom \tu\\Qf_\e^^com ?_^\QX\Q^^: Tg\Q\$Tc

Q\Qc du^qQs_c' \uc TU GQqc\sc' Dub_8 bkd_\eu Q`Qbu^du] U^du \u_RZbd_TU SQTQ e^QTU \u\\Qc' : ^SeQ^d_Q\\Qc \b_] \ucqc XUSXQc Qt\\
XU XQR\QT_ i Q @\c TYMSe\qTuc i Q\MSSY_^\uc aeu S_^_S\wU^\u\ Sebc_TU ce_RUTYU^SQ\\cu U\\Q] Q^\cec du^qQs_\cu \b_] \ucqc XUSXQc Qt\\\
LL≯+1'\$ J _c db_c c_k' _c aeu XQRt k` \udj Q^\usyT_ S_^] \w_U^\u] k` \underset \und

GUSSYı^≫

 $\label{eq:condition} $$ \frac{1}{\sqrt{UUU} \cdot UUU} \cdot WUTQ^TU9Y_c \cdot QQQU \cdot USQT_% TU, X_1 REUSQT_U \cdot WUTUQWUJ eledq\Q^UUS_WUTQT \ QQQCUDS_XUUU^dUS_^Se\ QXYMTQT $$$

B_ Uc ^USULQBY_UcdQbTU`YUc_RBU_d_T_ `QQ\`BUW6^dQ%_ aeU X_] RBUC BU^e^SQ\Q_c TUCU_c TU cec S_bQ_^Uc_TU9Y_c cWYMSQ8RQcdQS_^_RcUbf QbaeU UcdU] UTY_Uc%cY^TETQTUcdrQT_ 9Y_c `QQ_bTU^Qb_Trc`_^Ub\Qc S_cQc%u^Q\Wk^Qc`USd_e__b_%QcUQ\`_bXQSUb_^ XQSUb% QaeU\QS_^cUSeU^SQTURUbQcUbX_] RBUC aeU S_^dr_XQ^U^ccec `USQT_c' HQ^d_S]__ \[c X_] RBUC cUTQ^XQcdQ%_b_ dQ^d_ Uc \QS_^cUSeU^SQTUCe BU^TTY_%QcUQ] U^_c_] sc' GY9Y_c ^_] Q^TQS_cQc Qc.% `_bQSSw^__`Ud] Y_%aeU U\ `USQT_ cUbs \QS_^cUSeU^SQX\\ Uf U^d_ TU] eUcdQaeU ^_ cU\\Uc TQXQcdQ\UcQS_^cUSeU^SQQ GY RYU^\QS_^cUSeU^SQX\\Uf U3 TU] 9Y_c XQTUcUb

2/

@\\RUMDTTTU\Qf_\e^dOT ?_^QX\Q^^: Tg\Q\$Tc

@\%Ubd\T\U\Qf_\e^d\T

t/db/U/Q/RUbdQTU^ucUQce^d% baeU/QSe\`Q VQQQRQ^jQ#N\$U^aeU\$cebWUU^ddbQjU^dUTUe^ReU^ec QRec TU/Q\\RUbdQT

9UdT__SeQ;cUTUTeSU%aeUe^Q\&UddUYS\YQSM^i U,cUcW_TUe^Q] Q'UdQ% \QTWSe\dTTU`QcQb`_bU,S_^ddQ\%_XQSUaeUe^Q
`Udc_^QcUQU^QRc_\ed_] sc Uh`eUcd_c Q,`USQT_%_SeQ;aeYubS_cQSU*cebQR\UB`_baeU%Q] UTITQaeUQe] U^dQ\QTWSe\dT%DYd_SeQ*d
] U^_c cUUbueYubui Uc`Ubq 6e^aeUU^e^Qc`Usd_%cUYSbu] U^dQUh`_cUT^Ucc Q,`USQT_%QcQRUb`_be^Qe] U^d_TUUh`_cUT^Ucc Q\Q
] QQQSSW^e_] Y*W^4cY^U] RQbW_%cUfUTYc] YeYTQU^_db_cU^dT_%QbQuheYkbQb_4QcQRUb%_] _\Q`USQ] Y_cYTQT_ R\Q| QR\U^Ucc TU
\QQSSW^e_] Y*W^4cY^U] RQbW_%cUfUTYc] YeYTQU^_db_cU^dT_%QbQuheYkbQb_4QcQRUb%_] _\Q`USQ] Y_cYTQT_ R\Q| QR\U^Ucc TU
\QQSSW^e_] Y*W^Ucds TYc] YeYT_U^\Q] Yc] Q`\b_`_bSW^* 6cuaeU%u^\Wb^UbQ\%hQce^d_\Wh^SeQ*d_QUh`_cUT^\Ucc Q\QSe\'Q_\QSe\'Q\
aeUaeUTQ\WbQ\aeU_\kU

 $\label{eq:local_policy} \DQQ \Weddplied_\%e`_^WQ] $$ _c = QULSQQTU e^UaeYRBY_aeUcUQYdUYWU^dUY& e^QWU^dUYRBU% YTeUT S_^e^`_TUbTU = UaeYRBY_aeUcUQYdUYWU^dUY& e^QWU^dUYW^dUY& e^QWU^dUYW^dUYW^dUY& e^QWU^dUYW^dUY& e^QWU^dUYW^dUY& e^QWU^dUYW^dUY& e^QWU^dUYW^dUY& e^QWU^dUYW^dUY& e^QWU^dUYW^dUY& e^QWU^dUYW^dUY& e^QWU^dUYW^dUY& e^QWU^dUY& e^QWU$ _ XQSQQRQZ_S_^e^Q\&Ug`Q\W&Q,Qe^`Uc_TUTYUj\\RbQc4i aeU%_bdQ^d_%eUTUcUb^USUcQbY_TUaeU%U^SY&e^cdQ^SQc_^bj_Quc%Q $\parbox{Q}' \parbox{Q}' \par$ d_T_ce`_TUbTUQed_&_ff\\YVd_%`_b/_dQ^d_XQSU\\\)`_cYR\UaeUcU] eUfQXQSQQRQZ_`QbQ_^QTQAi `_b/_dQ^d_d_dQ] U^dUUhSecQc TUCTU SeQaeYUbdQ,] _ f Y| YU^d_' DUb_ cYce`_^U] _c aeU XQi Qcwl_ ^eUf U \/RbQ; U^\QUcSQ,Q_`eUcdQ%Ucd_ XQSU aeU ce] _ f Y| YU^d_ ^_ 'ji' `_c'R\U%'Ub_Qx^]scTN65Y4TU]_T_aeUQX_bQcw_`eUTU]_fUbcUXQSQQRQZS_^\Q\eub;QTUe^Q\Y8bQ4`Ub_cY^UjRQbW_%blcd_Uc dT_\ aeU cU lbbaeYbbJTUt\U^Ucdc SYSe^cdcYSQc4cUU^dbQJ U^dUUhU^d TU ^eUfU`Qbbb TU ce] _fYj Yb^d_4i cYQ UcSQQ%RQZ Ucdc $StSe^{c}QTSQC%MQT_{c} = UTQ% \ UDQTUSU^U \ UDC_{c} \ UDQCUSSe^{C}QCUDSe^{C}QT_{c} = UCSe^{T}_{U} \ UDCUSU^U \ UDCUSU^U \ UDCUSSE^{C}_{U} = UUCSe^{T}_{U} \ UDCUSSE^{C}_{U} \ UDCUSSE^{C}_{U} \ UDCUSSE^{C}_{U} = UUCSE^{T}_{U} \ UDCUSSE^{C}_{U} \$ `QbdUTUce]_fY]YU^d_4`QbQ_SeQ.def_dQ^dQ\/RUbdQTi\QfU^dQQX%QaeUU^SYbSe^cdQ^SQcXQRYbQUcaeUdVU`QbQU\]Qi_b]_f\j\Yu^d_\meUU^dQ\sqc_cubQ^USUcQ\Y_Db_aeUUcdQ^eUfQTYWSe\dQT^_cWWYWSQU^QRc_\ed_YSbUj_U^dQbceUh`_cUT^UccQ SeQaeYUbS_cQSU^cetQR(U_M`_b_dQ^d_U\ce`eUcd_TUTYMSe\nQTUcU^U\SQ|_Y__TU\TURUbTUe^X_] Rtb/%_\Q\QS\\TQT_`QtQU\`USQT_%Q dQ't c TU e QU T d L MQT c Q Q T e L L Q T C95 ^5Y_UCTUK XXRITU\Q\RUBDT%QfYbbtTiU,fYSY_%QSe\`Qi\QQQRQYjQ:\UFXDYT_TU`USQT_iSe\`Q%U,XQSUbTU_aeUUC f Ybbe_c_i TYMY_TUU_VM_%TURU XQRUbcYUJ`\bu YMeQ\TU\\s\K`^_SY_^Uc TU\,9 b K XYB\i TU\Q\RUbbQT%Q_R\YMQSYM^%Qf YbbeT%&\`USQT_% S' _\NUFWQ_dQWQ^YS_~CYCULYSQ p\YCYCUU^QRe~TQYSQ%eU\Q^USUCTQT UC YS_~CYCULYUS_^\Q QdebQUJ QTU`USQT__Se(`Q 9 YSU% U^U,dQQQT_Q^duc] U^SY_^QT_%#'*-'\$oEeYt^\`eUTUSe\`QbQe^Q\`Ubc_^Q\`QxQ\$Ub_aeUt\^_\eT__UF\QQ5 M%#'*.'\$GUcYU^T_ $\label{eq:cutting} $$ \cut{$\sim NU} \ U^2 \times COMODQ \ SeQaeYUDX_] \ RbU \ QbQ XQSUD\ aeU \ ^e^SQUCdef_ U^ce \ _TUb \ QbQ UFYQB \ M%Bs W, -*'$ \ QbQ \ SeQaeYUDX_] \ RbU \ ^QbQ XQSUD\ _aeU \ ^e^SQUCdef_ U^ce \ _TUb \ QbQ UFYQB \ M%Bs W, -*'$ \ QbQ \ SeQaeYUDX_] \ RbU \ ^QbQ XQSUD\ _aeU \ ^e^SQUCdef_ U^ce \ _TUb \ ^QbQ UFYQB \ M%Bs W, -*'$ \ ^QbQ \ _aeU \ ^e^SQUCdef_ U^ce \ _TUb \ ^QbQ \ _aeU \ ^e^SQUCdef_ U^ce \ _TUb \ ^QbQ UFYQB \ _aeU \ ^e^SQUCdef_ U^ce \ _TUb \ ^QbQ \ _aeU \ _aeU \ _aeU \ ^e^SQUCdef_ U^ce \ _TUb \ ^QbQ \ _aeU \$ _RUTUSUL5 MTU ^eUf_%U^\Q] Y;] Qi U^\Q`sWfQcYWeYU^dU%EeY;^^_WWdQ%aeUU: ^USUTQT`QbQ_bTU^QbU%U,aeU ^_dXU^U\Q\YRUddT TU XQSUb_ aeU Ucds] Q^TQT_4i aeU Uc Y^2cd_ `QtQS_^TU^Qb_%aeU _ dtU^U ^_ U^ce `_TUb`QtQ XQSUb_ aeU cU tUbeYUbU5 M D'

, 0, '\$SXQ_do_TYSX_%CUTQe^Q\Ui aeU_aeU_eUTUS_^fUbbbQQi RQc `QbdUc4\$U'_RUTUSUb_dbQ^c\WbUT\bU\\Q4`Ub_^Y\We^Q\Ui `eUTU\Ucd\bU^\$ S_^dQTU_aeU\Ucds_R\\WQT_`_b\Q^QbbQ\Uj Q

@\\RUbdoTTU\Qf_\e^doT ?_^Q\$KQ^^: Tg QbTc

66) Y^Q^_c U^WU^U6Q,c_^] ei Y^S_^cYdU^dUc S_^U/_c] Y;]_c%U^_ aeUTYSU^TU/QYYSQ`QSYTQT TU/,X_] R&USQIT_ U^UcdUcU^dYT_': _c] Q^dD/U^U^LBMSQ] U^dD/aeUcUbQY72ecd U^9Yc% QbQlbJaeUbbSeQaeYUbS cQTU^c doc \eUbQTU^eUcdo QSQ^SUQsdeQii \QSQ`QSTQT`QbQ \\UfQbQSQR_4i dQ| R\tank^1 \Q^dU^U| _c aeUUcdQ| _c Q\X_bQ\YSQ\Q TUBUQ\YQ\Q_RUTYU^SQ\\ Ub\U5dQ\% aeU8btd_1 eb\w\ QbQcQbt\Q5ub\Qc 'IJ `UBUSSY_'UL TU ^eULddQ_RUTYU^SYQI XQTQT_ `Qc_%aeU ^eULddQ_RUTYU^SYQ'IJ `UBUSdQ`_TbQCUbQSU dQTQU^\eWQbTU`UbUSdQ4U^T_^TU `QBUSU^YcU^cYR\U] U^dU`QbQ\e^SY_^QbQcu] Yc]_c U^\QYYS_^cYcdU^SQQ] sc Wb_cUbQ DQbQ#5_]_XU_RcUbfQT_U^_db_c \eWQbUc\$ c_cdbU^U^aeU 9Y_c%U^ce] YcUbS_bTQQ\QXe] Q^TQT%XQQR_\T_ UcQS_^cddbSW^_ \Q\Ui bWbb_cQ%eU UcdQRQ^RQZ e^`b/SYY% U^\eWQbTU U_%cU XQ Ynd_TeSTT_e^QS_^cddeStw^] sc ceQfU% ^_c`_^U^RQZ_e^Q^eUfQ\U %I\SeQ\^_ tUlaeYUtU] sc aeU\Q_RUTYU^SQcYSUtQ\j\`\UXU5dQ%TU QSeUtT_ $S_^\bullet$ (6) Sign of the contract of the contract of the contraction of the contract of the con $TUe^{Q}Ui^{1}\%QUi^{1}_Uc5B_`eUTU^cUbe^{Q}fY_QSW^TUce^{eUf}QUi^{1}\%QQaeU^_UbaeYUdb^aeU^_cUQ/Q_RUTYU^SQY]^`UbXU5dQ'^_Q_RUTYU^SQY]^.$ lbbaeYbbJ M ^_ `eUTU^cube^QfY_\Q\$W^TU ce Q^3MeQ\Ui %_b\$eQ^d_aeU%bWk^T\\$U^%cUQR_\Yw`_b\$_] `\\ud_4i ^e^\$Qucd;RQ] _c RQZ_U\\Q& 9YSU%_ cUbAQZecd_ 9Y_c QBJaeUbbTU $_c$ _bb_c_RUTYU%Q`UbVExQ%4QaeU $_c$ cUbAQZecd_ `QxQBJaeUbb5] sc TU_aeU `_TU]_c BUQ\YQ\$\%_`QxQ $SQcdWQb^*_c`_b^* TU/Q] Yc] Q M%_b_b_dQ^*_d\%_bce`_b_Y UcaeU] Q%QcY_I` `UbUSSY_^Uc TU ^eUcddQ_RUTYU^SQ^__] UbUSU^cUbSQcdWQT_c' @ A constant of the constant of$ $\hbox{cubQSU'dQT_\%EQ'T_\%IUQSeUbT_S_$ ce UcaeU] $Q\%cUbQYYZecd_U^cu]$ $$ is eucluling SeQaeYUb_dbQ_RUTYU'SQaeUN]$ `Ub\USd_5 oE et the properties of the propert$ $\text{``USUCHTQT TU 8 bbd_] _bb'` CQQTQb'` Qc_Q QQGU dQSW^TU 9 \underline{\text{'C TU dQ}_RUT'U'^SQW} QaeU cUbQYZecd_U'^t 1 \underline{\text{'`QSU' dQ5}} o=Q; Q_We'^Q ^USUCHTQT \\ \text{``USUCHTQT TU 8 bbd_] _bb'` QbQTQb'` Qc_Q QQGU dQSW^TU 9 \underline{\text{'C TU dQ}_RUT'U'^SQW} QaeU cUbQYZecd_U'^t 1 \underline{\text{'`QSU' dQ5}} o=Q; Q_We'^Q ^USUCHTQT \\ \text{``USUCHTQT TU 8 bbd_] _bb'` QbQTQb'` Qc_Q QGU dQSW^TU 9 \underline{\text{'C TU dQ}_RUT'U'^SQW} QaeU cUbQYZecd_U'^t 1 \underline{\text{'`QSU' dQ5}} o=Q; Q_We'^Q ^USUCHTQT \\ \text{``QSU' dQ5} o=Q; Q_We'^Q ^USUCHT$ $TU8btd_] ebt0^*T_`QtQ`bUfQUSUbS_^9Y_c ^_XQSUY^2EcdSQ5 &GYcUTYSU\%e0U8btd_] ebtw`QtQcQtbVQSUbUcQQ^dtMeQ\U_i`QtQ^c_db_c%_b_i$ `bUWe^qQb%paet_^USUcYTQTTU8bcd_]ebU/T_%aeU`_TbuQ^_cUbU^fYodeTTUe^Q\Ui%aeU#_bcec`brSYY_c\$aeUcUbuQU^cu]Yc]_Y2ecd_aeU TURU]_c XQSUb^_c%Y8bbd_ XQRuQ]_eUbd__^%_baeU%U^^eUbdb_`bbcU^dU UbdQT_%_c_]_c SQ`QSUb TU]_Q^dU^Ub_5 D_b_aeU_c Qb; Y^Q^_c $c_^YYS_1 \land QdRULC S_^U U_c] Yc]_c\%_cw_U^1_aeU cUTYSUTU VQ ^USULYTQTTU cQdcVQSSYw^TU 8 bbcd_1 QdQ Uh^YQbUCQc Yj_UbWbSSY_^UL%aeU ^_$ `_TU]_cUfYXQ%Y__dQ]RYL^U__aeUTYSU^TU\QWXQSQTU9Y_c%6_^SUTYTQQTU]_T_aeU`eUTUcUbaeU^_TURQZ_TUU\Q%Ub_aeU`_TbxQ XQRUbUc`QSY`QtQ^eUcdo cUbU^fYtoteTTUe^Q\Ui]scceQfU4HTQfQ]UWecdQbQ`bUwe^dQb%aet ^USUcYTQTTU8bcd]ebU/T %aeU`TbQ ^_ cubu/^fYbbeTTUe^Q\Ui %aeU#_bcec`br^SfY_c\$aeUcubbQU^cu]Y:]_Yf2ecd_aeUTURUj_c XQSUb^_c%eY8bbcd_XQRuQ]eUbd__^%_baeU/bu/ ^eUcdb_`&UcU^dU UcdQT_%_c_]_cSQ`QSUcTU]Q^dU^Ub_5D_b_aeU_cQb;Y^Q^_cc_^Y^S_]`QdR\UcS_^U_c]Y;]_c%_cw_U^_aeUcU $\label{thm:control} $$TSUTU(Q^USUc^TQTTUcQdc^QSSW^TU8bcd_Q^QQUh^YQbucQc^1)^USbucSY_Uc^MeU^_`_TU]_c UFWQWcY_d0] RYC^U^_ aeUTBU^TU(QWcQSQ^0).$ $\label{eq:ceq:u4h_TQfQ} \begin{picture}(0) \put(0) \put($

? ^QdKQ^: Tq QbTc @Q\YRUbaQTTU\Qf_\e^dQT

SQ`QSYQDQ\ c X] Ribuc`QtQ\\UFQbQSQR \Q RUTYU^SYQcYSUtQTU\Q^eUFQ\UF 8 ^SUT TUXUSX %#TYSUU\

T Sd bGdURRYYW&aeU` bU,`USQT _bWYYQ,%ucdQ] c d dQ,] U^dUTYCSQ`QSYQT c `QbQU,TUCU] `Uv _TU\Q. S ^TYSW/%Y^eUfQWQSQTU9Yc'DUb 9\W\%eUc\%eUt\%eUt\%eUt\%QQ\WQSQ\QT c ^ c db c\%J^aeU\QUf\eS\W^ TU/QU^VUb] UTQT%Lc bUQ] U^dU` c'R\U4i c RbU UcdQ RQcU cU`eUTU o M cUbs] sc ZecdQ] U^dU\ bUaeYUbQ^;GYU\ 9 b Gdurry Wdtu^u \o y^du^syw^tu xor\obs ^`b `Yutot% b V\bosopy\bux\bx ^t cu cy^aeu \o oc\cdu^syo aeu uc tu \text{WQSYQ% TU\\right\text{YbU_VQF bi R \text{\$TQT' DUb c\text{\$Y_U] RQbW\%\J\\\] \text{\$\color{\co bQ; ^QR\U%^ZecdQ; SbeU% QbQaeU9YcbJaeU%6] \QS ^T\SW^TU\`UbTw^%aeUXQfU^YF QcUb YI ` cYR\U` bU\`USQT bKMYQ'GYUcQcu%aaetWkQSQXQ;U^\Q`kUcdQSW^TUQcYcU^SYQi\QSQ`QSYTQT`QbQ \\UfQbQSQR\\QS\^TY\$YW^TU\`UbTw^5CoDbaetUc\\Q]QT\`bU\^]RbUTU\QVbQSYQ%

>@Qf_\e^dQTU^cu] \cdot Q \cdot \cdo TUSYS%e^aQ, UcdQT QSd c TU/Qcf \e^aQTUc TU\ c X] RBUC%c ^U^] eSX c SQc c TURYTQ] U^aU BUaeUBYTQc ` b\ c 8] Q^T c TUU\ c4i @c] f\]\\U^dc_UcdQT_TU\SeUb`_c_^SeUcd\\^TU8_]Q^T_%c_\Q|U^dUiQaeUUcds^ceZUd_cQ\Q]Q%\\\$US_^USdQ^S_^cecQSd_c' DUI_QK_bQU.Q]_Q^_dU^U_dbQVQSeVqT]_UTQYdU/QSeQ,`eUTU%U^U,cU^dT_] sc TYbu5d_i QTUSeQT_%U,S_^cU^df_YU\d_%U,bU\d_YU\d_9U U, Se] `\\] YU'd TU SeQaeYUb bTU'% Ub \Q\QSe\QTTU\Qf \e^QQT4i Uc` bUcQ\QSe\QT c \Q] U^dV;aeUU, Q] Q`eUTUTUc RUTUSUb LUSXQ|Q^T_%LUSXQ|Q^T_%|S'c_^%LUNk^U,c\WYW5QT_TU\cdt|;\Y_c%^QTQ|scaeUS\Ubd_cQ5d_cTU\Qf_\e^dQT'@Q_RUT\U^S\Q%\J^\Q ^QxbbQ\UjQ`bij QxbQTU\Q] Y:j Q%\uck_\c_j Uxij Yu^d_i Ukbu^TYj Yu^d_TU\Qf_\e^qQTTUe^_%Q\Qf_\e^qQTTU_ab_'@QTUc_RUTYU^SYQUc\QTU ^ `Wd Ydb%TU^ Se] `\\b\Qf \e^dQT TU\] Q^TQT %Q\Qf \e^dQT] Q^YWCdQTQTU\S] Q^TQ^dU Cab c QSd c aeU^ c ^\ c QSd c TU\Q f_\e^dQT%6_]_S\Ubd_c]_f\Y\^\u^d_cTU\SeUb`_iQdbQSY_^UcU^_U,Q;]Q%c_^_RUTV\^SQ_TUc_RUTV\^SQ_cw_TU]Q^UbQ\^T\USQ%QaeU $\label{local_problem} $$ \text{Ucds}^S_^U = \frac{S_^U \cup CdT__QSSY_UCTU_Qf_e^{dT}}{UQSQUUT_QQCDUT_$ `b_`YQf_\e^nQT``eUTU.cUb^USUcQb'_3i U\,cUbTU.e^Q.ReU^Qf_\e^nQT Uc.\Q] sc QTUSeQTQ%TYBUSQQ% ceZbd_YY] UTYQd_TU.S_] Q^T_4i cYUcd_

GUSSYu^ * '

 $: cdQ^*T_dQ^*d_YcYcdU^*_c UcSbd_bUcQd_Y^*Q^*_c\%aeU^Q^USUcYTQT UcY^S_^cYcdU^dUS_^QVUi_] Q^*TQd_% U^^`QbdSeVQb%$ aeU Lc QRcebT ce` ^UbaeU 9 Y c` bce] Q^T TURU IbUaeUblb\QTU\ c X] RbUc aeU c ^YSQ`QSUc TU XQSUb, 4^ `Utdj\MU^T U^UcdUSQc TUSeQaeYUbT\WUtU^S\QU^dtUYSQ`QSYTQT^QdebQ,i] bQ4AUWecdQbuQ% bdQ^d%cRbUdT QX bQ S_^cYTUbQb-UcdU] QblUbl&M `QbQ] Qi_bS\QbiTQT A U S\QbQ] U^dU UcdQR\USUb\Qc cYMeYU^dUc S_cQc'

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^_`eUTU cUb`kUcSbd__ kUaeUb7T_`_bU\8_] Q^T__`kUSU`d_%QTQ`eUTU4`QbQ

dQc S cQc cU`eUTUUh%Wb^Yv\k^ db] T aeUQ]UTYTQaeUTU'U^TU^i c ^\ c \land Led c TUe^QReU^Qf \e^dQT

dT Uc aeUQ,aeU] Q^T `buSU`d dU^UU,TURYT buc`ud 4` baeUUc UcduQSd aeUTUdubj YQdT U,Qce^d 3U^UcduQSd \Qc _RUTYU^SYQ_ TUc_RUTYU^SYQ] U^d%Qc%TU e^Q] Q^UbQ`USe\YQ#_c QSd_c S_^c\YMe\YU^dUc c\YU^T_ W_RUb^QT_c i TUbUb] Y^QTQc `_bt\' : cdUQSd TUWRYUb^ TURUcUbU, RZUd`b`Y TU,`bUSU`d% ^YWe^'8 b\QbY'+'HQ]RYt^cUTUTeSU%Q`QbdbTU\ aeUcUXQ Roubif QT %aeu cyxQi Qwk^qQsd % U, UcveUbj TU, Qj Q%Q^duc TU d T c \ c Qsd c \nkbuc TU U,USSYw^U^U, SQc %ThbMbi TUdUbj Y^Qb\ $XQ QSd_c TU/Q4cYU^T_ `_b/Qce`_cYSW^`bUfYQQd_T_c \setminus_c QSd_c TU/Qf_\e^aQT%QTUdUd_YQSW^i TQ^T_\eWQbQd_T_c cec QSd_c3^-$ _RZUd_TUS_] Q^T__`bUSU^d_Y*TYbUSdQ_bU]_dQ4`_baeUU_c^_c_d_^dQ^d_S_]_\QccUSdQc_\QcS_^cUSeU^SYQcTU\Qf_\e^dQT% CYUNT QYOULD TUICIT CICCO QSCIC GCUARU CYXQI QWEYQ RUTYUNSYQUN UCU QSCI BWYYQ, TU, Q,] QWQ TUCUU YYQSWN TUICIT QC YQC f /YSY ^Uc%Uc e^QSd TU_RUTYU^SYQU^\QaeU\Qf_\e^qQT_^ dU'\U^YW\e^Q\`bU_Se`QS\W^U^QRc_\ed 4_Q^dUbY bQSQTQQSd_TU $f_{e^{0}} = f_{e^{0}} = f_{e$ $f = \frac{1}{2} \left(\frac{1}{$ Ucd 5

 $M`_b \setminus dQ \wedge dV_0 \wedge SW \wedge Q_0 \wedge Y \wedge Q_1 \wedge Y \wedge Q_1 \wedge Y \wedge Q_2 \wedge Y \wedge Q_2 \wedge Y \wedge Q_1 \wedge Q_2 \wedge Q_2 \wedge Y \wedge Q_2 \wedge Q_2 \wedge Y \wedge Q_2 \wedge Q_2$ f_\e^dqT%\r^fUj_TU;cUbUcU^SQ\`QQXV\^SQ]_bQ%\`QQXU_cX_]RbUcc_^_cdUj_QcTU\<u>W_</u>RXUb^_]_bQ%\bc_j``\UdQj_U^dU S_] _ cU XQ_RcUbf QT_ QX_bQ4TURYT_ QaeU ce QSd_Tudubj Y\QS\w^_b\WY\Q\,^_ Uc QSd_TU \Qf_\e^dQT__TU\\Q U\USS\w^\%eU cUQ Q\d\c%_b \Qce`c\SW^\QSQTQQSdTU\Qf\e^qQT\MU\QjQ^^`eUTUcUbRZUdTUS]QYTU^U\QSdTU\Qf\e^qQT]\t]Q\QSeQ,TU`U^TUTU \QQ^dUXY bTUdUg\YQSW^TU\QSdeQX% Uc\TUdUg\YQTQ\ bt\\U\\Q] UTYTQU^aeU\U\ cUQ^USUcQXY%YV*T \QS ^cUSeU^SQi UXUSd TU T6X_Q5d_\QTUdUb;\YQ5W^Q^dUb;\b%eU^_ Uc.f_\e^ddbQ^USUcQb'_HQ] `_S_`eUTUU\X_] RbJcUb_RZbd_TUS_] Q^T__ TU.W_RYUb^_ U^ cec QSSY ^Uc Unduby Bulc4` baeU Ucd c c ^dT c ^USUcQby c%\U^T \ c UVUSd c ^USUcQby c TU\ c QSd c TU\Qf \e^dQT cu] \text{Y} c 'DQbQ aeU\QXe] Q^TQT%TU QSeUbT_ S_^UcdU UcaeU] Q%c_^ce**Z**Ud_c TU] Q^T__ W_RYUb^_] _bQ, U^^QTQ U^QRc_\ed_4i d_TQce QRUTbu_cU UhS\eiU`_bS_]`\\ud_% ^_aeUTQUc`QSY_`QtQ\QfY**bb**ET__U,fYSY_U^U,] e^T_'D_b_aeUU,UcaeU] Q6bJ Y*\Q^Q% ^_\QTU_c SQfY^cdqc%Lc d dQj U^dUYS] `QdR(US ^U, W RYUb^] bQ% S ^dT U, ec TU\Ui Uc% bUSU`d c% b XRYBY ^Uc% b] UcQc Q| U^Q| Q: HQ| ` S XQ| ^YW6^Q| Q^UbQTU XQSUbcec `b/SYY c S ^c/cdu^S ^ucdc S cQ: : ^uvU5d %Ycu `eUTU TUSY%eU ^ XQ| `BUFY_QSd_TUBUB;\YQSW^TU\Q]_Q%aeU`BUSUTUQ_c QSd_c TU\QF_\e^QDT%Y_ aeUF_\SY_^Uc c_^UFU^d_c aeUceSUTU^`_bQSSTU^BU `eb_%Y^^YV&^QSQecQTUdUbj_YQ^dU%Jcd_Uc_] sc`Q;`QR\UYS_]`QdR\UcS_^d_T_U,ec_TU\Qc\UiUci`bUSU`d_c4`_baeU^QTQUc] sc cU^SN, TU\ aeU\Q; \Ui Uc`eUTU^cUbTU^YWe^Qed(\TQT`QbQTYMMbi bUWe\QbQSSTU^dU`Ub\U5dQ8\, c aeU% b\Qce` cYSW^TU aeU cUQ`eb_QSSYTU^dU%Lc aeU U^ ^Y\Wk^SQc_Ucds bUW6\QT_ `QtQSeQaeYUbS_cQQ^dUbY_b4`Ub_ aeU `QcQ%TU UcdQ] Q^UbQ_ aeU%_b SQceQ\TQT%Q\Q`Ub\U5S\w^%

@\%Ubd\T\U\Qf_\e^d\T

*' @f_/e^dT_n~nT GX_PG+nqQtnqQ n,qn,x2\xd1 / 2 ~qqqx, ln/ aennr dx_Pdx2\xd1.'

*' @t_/e-qdt_n~n'] "] n,q ln/dsq ll,nqn,x2\xd1 / 2 ~qqqx, ln/ aennr dx_Pdx2\xd2\data.

*' @t_/e-qdt_n~n'] "] n,q ln/dsq ll,nqr dx pdc,x2npd n,qn, ln/dx2\xd2\data.

*' @t_/e-qdt_n~n'] "] n,q ln/dsq ll,nqr dx pdc,x2npd n,qn, ln/dx2\xd2\data.

*' @t_/e-qdt_n~n'] "] n,q ln/dsq ll,nqr dx pdc,x2npd n,qn, ln/dx2\xd2\data.

*' @t_/e-qdt_n~n'] "] n,q ln/dsq ll,nqr dx pdc,x2xqqq n,qn,qn,qn,x2xdq n,qn,x2xdq ll xqqn dcn] x] ", ", 2xx, prn,qn,qn,nc ce, ",np cq,q" , entin n/mpaen cn/n xi, " dy q v2n v cqq v2, entin n/mpaen cn/n xi, " dy d v2n v cqq v2, " d

@\%UbdTTU\Qf_\e^dT ?_^QX(Q^: Tg Q5Tc

TUDDI YOUUN SOC_ID_b/_ dOY_d dUVU aeU cUbQcu%aeU cYUcdu Qsd_`BIJ Ub_TUDDI YOYT_ aeU cUVSQ _BWYQ i TU W_RUDY_ TU d_T_c4/_ SeQ, Uc QRCebT_4`_baeU Uc TU ce`_ *UbaeU cUQSQ _BWYQ i TU W_RUDY_ TU d_T_c4/_ SeQ, Uc QRCebT_4`_baeU Uc TU ce`_ *TeSU i W_RUDYQbU Qsd__BWYQ i TU W_RUDY_ TU d_T_c4/_ SeQ, Uc QRCebT_4`_baeU Uc TU ce`_ *TeSU i W_RUDYQbU Qsd__BWYQ i TU W_RUDY_ TU d_T_c4/_ SeQ, Uc e^QS_ *MQTSWY

GaeuchXQ aentrenswende-ven/ol nun-anakenen en anakenen e zoadak in/ aennnol nundo xoenan qi en indi noru-anakenen en anakenen en anakenen

: ^`bij Ub\eWQb%aeUcY_bcUb%MeQj U^dU^SQ`Q`%UU^dU^TU%QaeUbUQj U^dU^_`eUTU^4QS_^dreQ5W^%YUj`buaeU\QYSQ`Q5TQT Uc] UtQ] U^dU] _tQ%Lc \$10tbg_4Qf_\e^dQT%L^d_t_c_c \$Qc_c%Q\$dxQ`_b^U\$UcTQT] _tQ%_Uc]_tQ%_Uc]_tQ\U U^\$Q`Q`TUQ\$deQbTU_dbQ]_Q^UbQ%5]_ fubTQTUbQi%U^e^SQc_S_] __do_4S_] _%e] %TU] U^dUS_^SR_%QcXT_ `UbUSdQ] U^dUi QRe^TQ^dU] U^dUTU] _cdbQT_ `_b_ aeUcUXQT\SX_U^ $\mbox{\sc NQ}^*$ Qall $\mbox{\sc NBUTUYUUTUSMcUaeUUc}^2$ $\mbox{\sc NBUTUYUUTUSMcUaeUUc}^2$ $\mbox{\sc NBUTUYUTUSMcUaeUUc}^2$ $\mbox{\sc NBUTUYUUC}^2$ $\mbox{\sc NBUTUY}^2$ $\mbox{\sc NBUTUY}^2$ $\mbox{\sc NB$ $\begin{tabular}{ll} UJ & RQM^{\circ} eUTUUcdQb] & cVUZc TUcUbSQ^{\circ} QJ & TUXQSUbQW$^{\circ} cS_cQc & aeU_db_c' 8_] _ \begin{tabular}{ll} UcU^{\circ} S_cQc & aeU_c X_J & RMc c_^^Qa$LQJ & UcU^{\circ} CX_J & RMc c_^Qa$LQJ & UcU^{\circ} CX_J & RMc c_^QaLQ YSQ`QSUcTUXQSUBI ^Q`Utac_^Q%5eiQ\éUtjQ^_Uc] scaeUceWSYU^dU`QtQ\UfQ^dQbU,`Uc_TUSYU^\YRbQc%UcdQ^fUbTQTUbQi bUQ] U^dUYSQ`Qi $QseUbT_S_^U, ec_S_] \times ^TU/Q, QQRDQ/dUU=Q] Q_b \times SQ QSTQT, QDQUU_D_b = eUUc U_QYSQ QSTQT] = LQ_1 - X_1 RUUc$ fubrqrubq] Undu]_bq] UnduYsq`q; TuUklwbs_nbdqQQ/qYsknqsbknqsbkqeUUn_]sc]kn`j_`bufqksu4,%Q,s_nbdqby_ruaeUk,]_bf_% $Q (Q f Y d Q \% U b_Q x^Q c u U C d T U (Q S Q S f Q T T U U U Y S Q A Q C U C d U A Q C Q S f Q T T U U U C Y D A Q C U A Q C U C D U A Q C U C D U A Q C U C D U A Q C U C D U A Q C U C D U A Q C D U A Q C U C D U A Q C D U$]_df_] ei ce`WY_bQd_T_c_cTU] sc U^\Q\&UbjQ MTU ^eUf_%QY^SQ`QSTQT`eUTU%U^Q\\&^_c Qc`U5d_c%U\\Q] Qbs] Qi_bU^Q\\&^_c`Ub_ $\text{CYU] } \text{RQbM}\text{MLcds}] \text{ sc } \text{LVZ} \text{c } \text{TU} \text{cUbSQ}\text{ } \text{Q} \text{ } \text{TU}\text{LVFQ}\text{Q}\text{bUbcdU}\text{x}\text{MB} _ \text{ } \text{L} \text{c} \text{aeUU, } \text{Q}\text{MUbY}\text{BH}\text{ } \text{QcuBTU}\text{ } \text{QSeUBT} \text{ } \text{S} \text{-} \text{L}, \text{ec} \text{-} \text{S}] \text{ } \text{x} \text{-} \text{TU}\text{ } \text{Q}\text{-} \text{Q}\text{MBD}\text{MBD}\text{MBD}\text{ } \text{U} \text{e} \text{-} \text{Q} \text{-} \text{Q}$] Q _b>SQ`QSNTQT`QbQU_' D_b_ aeUUc U^\QYSQ`QSNTQT`] _bQ\ I ^X_] RbUUc fUbTQTUbQ} U^dU] _bQ] U^dUYSQ`Q`TUU\UN\b5_^bbQQQ\Q ^\$\^Q\$\\^Q\$\\eq\$\\@eU_] sc] \n\j _ \bufQ\U5U4_%Q\\$_^d\Q_TUaeU\\] _df_%eU\\s_^c\TUbQ^T_ d_TQc \Qc \$_cQc%bU^U\Q\\eU\g Qi \QfU^dQ\$Q\X_bQ`Q\Q] _fUb\Qf @\\Rubattr TU\Qf_\e^attr

$$\label{eq:mapping} \begin{split} \text{MWQTU}] & \text{sc}\%_\text{aeU}\text{cU}_\text{RcUtf}\text{wU}^\text{Q}\text{bij} \text{ UbQ}^\text{CodU}\text{TU}\text{cdUTYSebic}_\text{NJ}^\text{B}\text{UQSW}^\text{S}_^\text{QYSQ}^\text{CSTQT} \text{ aeU}\text{QCU}^\text{TU}\text{e}^\text{XSR}^\text{M}_\text{VE}\text{IdQ}^\text{SW}^\text{S}_\text{QYSQ}^\text{STQT} \text{ aeU}\text{QCU}^\text{TU}\text{e}^\text{XSR}^\text{M}_\text{VE}\text{IdQ}^\text{SW}^\text{S}_\text{QYSQ}^\text{STQT} \text{ aeU}\text{QCU}^\text{CSTQT}_\text{LQ}^\text{S}\text{LQ}^\text{LQ}^\text{S}\text{LQ}^\text{LQ}^\text{S}\text{LQ}^\text{S}\text{LQ}^\text{S}\text{LQ}^\text{S}\text{LQ}^\text{S}\text{LQ}^\text{LQ}$$

: ^cUWe^T_ \eVIQUATURU du^UbcUU^SeU^GAU^CU] U^dU SEUBT S_^L aeU cU_RCUBf wQ^dUc%aeU%NVESdfQ] U^dU%Q QWe^QYSQ QSTQT%aeU UC] UbQ] U^dU] _bQ%U^\(Q) QQ b_`YQTQ] U^dU S_^U, ^] RBUTU >SQ QSTQT4i aeU U^U,] sc UcdbGd_TUS_b_TUUh` BUCW^%e^ \
X_] RBU` eUTUTUSbcU aeU dU^U e^Q S_cQU^ce `_TUB%cY_dU^UQ Ce U\USSW^% ^_` eUTUTUSbcU aeU UC YSQ Q TUU XQSUbe QS_cQ% SeQ^T_` eUTU%YQX_BQ QWGTQ%_SQTQfUj aeU dU^U e^TUCU_` b_`Y_%TBUSQUUY] UTQQTU\Q] Y;] Q: ^SeQ^d_Q_c TUCU_c i
UC\eUG_C%aeU` eUTU^ UcdqbU^S_^dQTQfUj aeU dU^U e^TUCU_` b_`Y_%TBUSQUUY] UTQQTU\Q] Y;] Q: ^SeQ^d_Q_c X_] RBUC cU` eUTUTUSbaeU cUQ
YSQ Q TUUIYBQBU_c UBZBSSY_C%aeU c_^\c TUCU_c bU] _d_c i UC\eUG_C U^T c QC` USd_c': ^` bj Ub\eVIQUAUNS SQ ; ^cUWe^T_\eVIQUAUNU \
YSQ Q TUUIYBQBU_C UBZBSSY_C%aeU c_^\c TUCU_c bU] _d_c i UC\eUG_C U^T c QC` USd_c': ^` bj Ub\eVIQUAUNS SQ : ^cUWe^T_\eVIQUAUNU \
YSQ Q TUUIYBQBU_C UBZBSY_C \SeQ^d_Q Q dUJ `_4^e^SQ \
UCds^` BUCUNU VQ aeU CUUBZBUTUU cd_c%U^C uJ Y;] _c S_^STUDQT_C%_^QWGTQR\UC% Ub_U^S_ADQU_X SR Yd_i \QYSYYQSW^U^C \C \SeQ^d_Q Q dUJ `_4^e^SQ \
f_\SY_^U UC U^\QaeU CUUBZBUTUU cd_c%U^C uJ Y;] _c S_^STUDQT_C%_^Q QWGTQR\UC% Ub_U^S_ADQU_X SR Yd_i \QYSYYQSW^U^C \C \SY_C U\C \SY_C \C \SY_C \SY_C

>>> 6 `UCQDTU (Q_`_cYSY\^TU (Q` b_`YQf_\e^dQT%_\Q) Yc] QVd_UCQC S_cQc QTUSeQTQ| U^dU`eUTU^cUb] Q^TQT_% QQQaeU_c X_] RBUC
8_] Q^T_4QS_^d^eQSW^%U^QWe^_c SQc_c%e^UcdQT__ e^QSd_TU f_\e^dQT `CUUV~cUbBJaeUBY_c S_BBUSdQ] U^dU%aeUU^\QQSdeQXTQT ^_Uc%
aeU dQ] RYL^`eUTU VQ\dQbTUc`et c TU aeU cU \U_bTU^Q M`_b_ dQ^d_UcQc S_cQc QTUSeQTQ] U^dU`eUTU^cUb] Q^TQT_% QQQaeU_c X_] RBUC
dU^U^e^QY^SQ`QSTQT]_bQ\

 $\label{thm:condition} $$HQ_UcdQT_QSd_TU_Qf_e^dQT%eUTU^cUbBlaeUbT_c`_bU_8_]Q^T_%S_]_iQ^_UhcdU_D_bcYUcQf_e^dQT_cw__`_Tbs_cUbTUcYWYQT__`QtQ_aeU_iQUcds%__`eUTU_XQRUbec__TU`_BLSU`_d_38_]Q^T_cU^_d_T_cV_cSQc_ccUbQ`_UbUsQbU_U^dU_YxdX_UY_`UbdYU^dU_M^_cw__`eUTU_dQUcGU_BLaeUbBs%S_]_Uc_aeUbUbQ^dUcTU_aeUU_S_]Q^T_cUTQ%cY__dQ]RY_S_]__`_cYR_U]U^dU`_eUTU_aeUBUb$$

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 $\label{two_constraints} Tuc`et c4dQucs_]_QUh`_cYSW^TU.8_] QT_`eUTU ^ cUbUXSQ` QdQ`b_TeSb_ UhSYQU 9U_S_4dQX\%_XQ dQ\s_cQS_]_Q\\ Tuc_RUTUYSQQe^] QTQd_QTUSeQT_i aeU\US_bbuc`_TUUc`_cYR\UUYSeQaeYbSQc_4i ^_XQ ^YWk^SQc_`_cYR\U%W^UaeU^_`eUTU XQRUbe^QTuc_RUTUYSQTUVUSde_c_'6b| Y^QC_caeU^_cU`eUTUQMQ QWWUYb| QS_XUbUYUS_cce`bYSYY\%_baeUUcd_XQbUaeU\Q &UUUU YQC_caeU\Q Cu _RUTUYSQQ_cS_] QT_c&cd_i Q`b_`YQT_caeU^_cU`eUTUQMQ QWWUYbWSQ| UYUWQcQRUb aeU\Q @Wii U\8_] QT_c^S_^CYdUYduc S_\Qc \Warday YQC_TUbb_SQbQQcu _RUTYSQTUU'U YQC_TUbb_SQbQQcu _RUTYSQTUC'U YQC_TUBB_SQDQCQCU _RUTYSQC_TUBB_SQDQCQCU _RUTYSQC_TUBB_SQDQCQCU _RUTYSQC_TUBB_SQDQCQCU _RUTYSQC_TUBB_SQDQCQCU _RUTYSQC_TUBB_SQDQCQCU _RUTYSQC_TUBB_SQDQCQCU$

@YSQ`QSTQT`^QdebQ%aeUcebWUTU\Q\QdQTUSQ`QSTQT`^QdebQ%_e^_RcdsSe_Uhdub^_%#aeUUc_x^6_aeUcU\\Q] QS_bbusd] U^dU

>SQ`QSTQT%i c^`TeTQgX_\i UhSecQc%_XQSUe^QS_cQYTURTQ] U^dU\QSeUcdw^TU8_] Q*T_'GY_cX_] Rbuc Ucds ^UhSecQT_c†U

XQSUb_ QSdeQbTU^YWk^RVV%cUce`_^UaeUcUb_bTU^QT_%dU^UaeUcUbQddQftcTUQWk^TUVUSd__e^_RcdsSe_aeU^_Ucds U^U

`b_`Y_K *\\% Ub_iQcUQU^\QSQ`QSTQTTUU^dU^T\] *\U^d_%_U\SeUb`_%_XQSQ\\eUdQS\\see] cdQ*SUc'\&6aeuT_c_dbuc S_cQc`eUTU^cUb

RcUbfQTQc%

The construction of the co

 $+ : ^SeQ^*\underline{d} \ QUCdU d'_TU]_f ij \ YU'\underline{d} \ c \ TU SeU6_\% \ UZUSSY_C \ i \ QdUdQSY_UC \ TU/Q] \ U'dU%aeU _ S_^cYdQ^*U^_c \ QG_C Y] \ YU'dUc_UCdT_TU/Q \cdot \underline{b} \ YQf_/e^dQT \% \cdot U_C \ QG_C U'T_^TU_^ XQ \ VQ_dQTU e^Q SQ \cdot QSITQT TU U'dU^TUbaeU/QYSQ \cdot QSITQT% \ aeU cw_%uhSecQc%$

@\\ruadpt \tau\qf_\e^dqt ?_^QXQ^^: Tg\QbTc

aeUS_^cXdUV^QQQTUS_^UNW^UYDUU_c i \Qf_\e^qQT_S_^cce TURUb4i cY_dbQc S_cQc ^_TUJ eUcdbQ^UCdbS_^USdQT_S_^cce f_\bW\%\L

GeUST_S_^\Qc \U U U U TU\Q ^QbbQUJ Q% QbQcUbS_^USdQT_S_^cce f_\e^qQT\%\Q QaeUS_^USdQT_\square G\footag\foot

, '6] R_c dY_c TU \Rightarrow SQ`QSTQT ^QxbLQ\LV% d_T_ \Rightarrow SQ`QSTQT aeU UhSecQ%U `eUTU^LUc_\f UbU^e^Q S_cQ4QcQRUL%QxQTU SQ`QSTQT ^QxbLQ_ \Q\belig Q4i QcUQ\QSQ`QSTQT TU S_] `LU^c\w^%_ \Q\belig QUhdUb^Q DQtQSeQ^T_ UhYbdU^TU\LSd_c U^\U\ UhdUb\bi _c _RcdsSe_c%_ cUbQ^_RcdsSe_c%_Y^_ \belig Q

TO SUBJECT LINGUISTAND LING IN LOCAL AND TO SUBJECT TO

GUSSYI^j'

$\begin{tabular}{ll} EeU \c Y SUBITQT TU \c TULU \c i ULYEU; $$_c\%_c SeQ_UL\%U ce'_^UaeUUhSecQU^U, YSe] '\label{total} Y TU \c S_cQ: TU $$ cSReU'_%_RUU \d T__U' SeU' \d Q $$$

: c] eSX_YCYCMWU^`_b] eSX_c%TU aeU QWe^_c X_] RBLc%Q`LcQpTU aeU ^_ c_^SQ`QSUc TU BUQ\Y QbqBLQc Uc`YBMeQLLc%QLLc S_] _ U\
QBLU U^dY YU^d_TU\`LSQT_%L\Q] _bQ9Y_c%e^S_bTQ\QSU`dQSW^TU8 bcd_S_] _ U\`eUcd_i _\VSUSYT_U^U\: fQ^WUY_% S' cY^UJ RQbW_%

`eUTUTUCUQbCYSUBQJ U^dU i dQQbTUc` et c_TU UcdQc S_cQc4i `_b_ dQ^d_TURU cUbTYc`U^cQT_4aeU cUQ bQ;_^QR\U Se\`Qb`_b\Q_] YSW^

TU UcQc S_cQc%aeU cYSUBQJ U^dU TUcUQ^i cU Uc\eUbj Q^`_bXQSUB% Ub_ ^_`eUTU 8_^BL\c\ USd_Q Ucdu Qce^d_%cU`eUTU^_RcUbfQb\Qc
cWeYU^dUc S_cQc'

cYU^T_dQ| RYL^] ei S_TBY_cQi SUBSQ^_%] ei UZUBSYDT_i U^dbcdUSYT_`_b\QT\c] YeSW^TU.ce `Qdb| _^Y_% \Q`Ubc`UBdf'QTU\Q`_RBU|Q%U^ e^QUC`USIU`eUTUTUCUQb/QfYbbeTTU/QdU]`\Q^;Q4i Qe^aeUcef_\e^dQT`bUcU^dUUc`QbQcQbCVQSUbceUndbQfQMQ^dUQ`Udd_%Y^U] RQbW_% `eUTUTUCUQbaeUdU\Qe^S_LQ w^`QtQQRcdu^UbcUTU\édeb_cQSd_cTUYYdJ|`UtQYSQ%_QRQYT_^QbcecUrSUc_c%QdqftcTUe^Q\Q,QTU f_le^dQT`QtQcU`QtQtcUTU.ceTY^Ub_3`Ub_Qx^Qcut\cWeUS_^ceUj RbQWeUj.4cecTUcU_ciUc\eUgj_ccc_^Yce\W5UYdUcUYUW5QSUc3e^X_j RbU \(\text{Lf}\) Qf_\e^d\d\Q\\\Q\S_^dreQ\$\\rightar TU RURUbU^\UrSuc_3Ge TUcU_ Uc] ei \(\frac{1}{2}\) \(\frac{1}\) \(\frac{1}{2}\) \(\frac{1}{2}\) \(\frac{1}{2}\) \(\frac{1}{2}\) \(\frac{1}{2}\) fUbTQTUb TUcU TUaeU\QfYbobtY\\ baeU^ Uc aeU\QfYbobtY\\aeUdUb| YQcec TUcU c4^YdU/U^^YWb^QbUQ\$Yw^TXbU\$dQU^QRc \ed QU\\Q : c cw\ $\label{eq:locality} \text{U, U, Y, U} \text{Loc} \text{ T/Y U} \text{Loc} \text{T/Y U} \text{Loc} \text{ T/Y U} \text{Loc} \text{T/Y U} \text{Loc} \text{T/Y$] ei YTMUSdQ] UYdJi TUV_b] QYQTUSeQTQ%YS\ec_S_] $_{e}$ \] UTY_YUSUCQYY_`QQQWQQMSQbU,fYSY_TU\QQFQbSQ D_b_dQYd_%c^X_] RbJTUe^ \$_bQ`w^`\Ub'Ubc_i] QfQT_%aeU^_dbU^UQ] _bQ9Y_ci TU?UceSbbcd_%Y_ aeU%_bU,\$_^dbQY_%YU^T_] ei `b_VQ^Qi \Q\$Qb^UY^\$\Y^QT_%bU^U.\] Qi_bTYCW&cd_TU\Qc.S_cQc.TU\QbU\WW%\%\QU^U| YcdQT U^S_^dbQTUU_c4Qx^cYU^T_TUe^QVQ| \YQ%@U%TUe^QVWU^UdQSYw^Q_dbQ%dU^U^\Q] Qi_b`QaduTUU\\ c] ebXub_^%u^\QZefU^aeT%TUe^S_^ce] _ XUbUTMQbQ4i QcudU^Ub`_SQUc`UbQ^jQTUfYTQ\QbWQ4i XQRYU^T_ cYT_YcdaeYf_U^\Q ~USUCYTQT TU e^Q[_bce`kU]__Q8bcd_% \Q\QddeT TU ce] eUbdU i ce\by YV^d_c%_^U\Y^TU ce cQfQSW^UbUc^QTU\Q] YUbQ4GYU^Ucdc Stise^cd(/SQ: TURUbQ%_bU, dU] _bTU_c d_ti} U^d_c Utubr_c%UcU_ aeU dU^Q dQ Tt'_c'SW4'\ Ub_ ce S_tQ; w^`b_V2_i SQb^Q; bUcd(/dVc)WeU d_TQf+uQU^ce TYEMecd_XQRYdeQ4i \QU^U] YdQT 5_^9Y_c i \QUL\YMM^% d_dQ] U^dUcY^^YMx^UZUBSY_TUUcUQI _bi WbQddeT%#5_] _%Y^TETQ%\\] Y;] _c TU] _^Y_c%Q`UcQbTUd_T_U,TYQxw\Ys_TU ce dU]`UbQ| U^d_%TUcQbQ\^S_bQ| w^cQ^d_%Y`_bU_c\W^\MSQaeU`_TbQ^cQ\\bTU3\$ TU] _^rc U^\UcdUSQc_%_ XQi e^Qf_\e^qQT c\rSubQTUQ] QbQ8bbcd_i cUUSSY_*Ui \QddeT TUce] eUbdUi ce\bf\ YU^d_c%_^\U,\bf\TUce cQfQSw^ `b_VQ^_i SQb^Q\bucdQ^dU%\WeUVeUd_TQfuQU^ceTYcWecd_XQRYbeQ4i \QU^U] YcdQT S_^9Y_ci \Qbb\WWx^% d_dQ] U^dUcY^^YWk^UXLbGbY_TUUcUQ]_b i WKQddeT%#5_]_%cY_TeTQ%U,]_t]_cTU]__Y_c%Q`UcQbTUd_T_U,TYQRWK5_TU.cedU]`UbQ|U^d_%TUcUQbQ`QxQe^S_bQ|w^cQ?d_%Y^_bU_ $\verb|cwwwfsQ| aeU`_TbdQ^cQ\bTU3$TU]_^{\underline{Y}}c U^`UcdU SQc_\%_XQ; e^Qf_\underline{Ve}^dQT cY^SUbQTUQ] QbQ8 bbd\underline{d}; cUUSSY_^Ui \ QddeT TUce] eUbdUi \\$ ⅆህՂሲሲሊ TጎC`_CYSWY4`U_D_ ce S_EQ W^`\ը\QY_i SQX^Q, ዜህ-ሲሲንብሥራንያቀሁ d_TQf เQU^ce TጎድWécd_XQRVæQ4i \QU/U] ነታሲፒT S_^9 Y_C i \Q\ዜ\ለያለምለ% d_αQ] U′ብሀ ኖ/` ኅላሦк^ ሀጀህይ

*)/

+' @ aeUcU\\Q] Qe^TUcU_i \Qf_\e^qQTTU\ c TURUbUc XQSQU, YdUbY bYTU dQ, ^_ bUQ\Y Q^U\, c%dU^U U, bUc` Ud Q Ucd c TUBUSX_c cwl_ YTYBUSQD| U^dU i TUV_b| QbU] _dQ% Ucds YS_bbUSqD| U^dU\\Q] QT_4^_ cwl_ TURYT_ QaeU#\$_] _cU_RcUbf w] sc%_ UcdQc S_cQc] Y;] Qc%YY_ _dtQS_cQaeUUc UhdtQvQ%Lc U_RZbd_ aeU dubj YQUcdQc f_\e^dQTUc i TUcU_c'

1 eUFQU^UcQTYSUSSW~

*'@aeUQaeucUce`^U%Nuce^WMQ^Udbb%N_U\QRcebT_Rbed4Y^Sjec_aeU\cX]RbUc`eUTU^U\UMbcYSUbYTQTiU\TU\U_TU\c TURUBUL UC`YBBQUL TU QI_BBQSU`dQSWY\$UJUSSWY\$USXQI_%US''aeUS_^CYdUU^U,UZUBGSY_TU\Q] Yc] Q%_U^\QTYC`_cYSW^i \Q YSYYQSW^TU, S_bQ w^K X\4i cY^U] RQbW_%_ uc SQ`Q| TUTucU] `UvQb_ uZbBubU_c' : cd_ uc QRcebT_%_baeU uc QRcebT_ ce`_^ubaeU $e^X_{_} \ RbJ TMUSdQ_U U^dU^QTUSeQTQ_U^dU^c CYSUbQ_U^dU^C CQYSVYQSW^% \\ eUQ,] \ Y_{_} \ dU_{_} \ Y_{_} \ Uc \ S_{_} \ duQ_{_} \ Q \ Ce$ $\verb|YS|YQS|W^` baeUUcd Uc \ aeU \ aeU \ CUbYS|YQT Q \ QaeU \ CUcUYS|YQQ \ GYe^X \] \ RbU%U^U \ UcdQT \ i \ \ c \ QSd \ c \ TUce$] %]_c \$_^xdu^u^ucQ] %] Q\$_cQ4aeU\$_^xdu^u^u\ucdqT_i Q\$d_c TU\QcYu^T_ Qcuv_b] QT_c i TY\$WYT_c' GYU,Q] Q\$Quu^v_b] Q $\label{eq:total_control} \mbox{QTUSeQTQi cYSUbQ] $$ $$ $ \mbox{QTU} \mbox{QTU} \mbox{QTU} \mbox{QTU} \mbox{QTU} \mbox{QTU} \mbox{QU} \mbox{QU}$ `b_`Y_'6`UcQbTUaeUSeQ*T_e^SeUb`_U^]_f%| YU^d_SQUU^e^QTYBUSS%/^b_`eUcdQTUce]_f%| YU^d_%aeUUc \Q] Yc] QS_cQaeUcU @\\ruadpt \tau\qf_\e^dqt ?_^QXQ^^: Tg\QbTc

 $t/S_{\rm substant} = t/S_{\rm subs$

, 'EeUUcdQ9'£' c'\$%/^YTYUSdQ^ UcaeUU, UZUSSY TU\Qf \e^dQTaeUU,S] Q'T bUaeYUbU4`Ub UcddQ] U^dUe^QTWUbU^dU4 $\text{CYDT} = \text{$^{\circ}_{\text{L}}$} \text{$^{\circ}_{\text$ f You'ET TU \Qf_\e^dQT%Q\QaeU U\S_] Q^T_dU^U cU^dT_% $-': cdQ_dtQf_\earline{Colored} \label{eq:colored} acute ac$ \QqQTU\aeU\QReU^Qf_\e^qQT] \tag{SeQ\cU_bTU^w4^_cYU^T_\ aeU\bUc`_^TU\iSe] \\U\Q_bTU^%\cubd_dQ\U\dU `bfQT cTU\QfYbdeTaeURecSQU\S]Q^T'6TU]scTUY(ecdbQbUcdQSeUcdW/3GYe^^Y/ dbU^Ue^`QTbU]scUhSU\U^dU $aeUcYU]`bU\ XQdbQdQT_S_^R_^TQT`QdUb^Q\ idUb^ebQ%\ dYU^Ud_t_c\ cU^dYt_c\%u^0\]\ sc\ Qd\ WbQT_\%\ UbUSUce\ Qi_b$ i bbc`USd_RUTYU^dU% Uc.8_^d_T_]ei bb6_4`Ub_U\XYZ_Uc.TU.e^QTYc`_cYSYw^dQ^fY(%aeU.YYfUdubQTQ.QR_bbbSU.Q.ce `QTbU4i%cY^U]RQbW%aeUQ`bUXU^TUbce TYQt\UcS] `QbQTU] cdbQbcebeYQ%dbQiU^T \ x\dij QUcQc SYSSe^cd()^SQc QRi USd()c%aeU c_^] ei QTf UtcQQce Qf QXSQi \QQ] RYSYV^4aeU%_b_ d()^d_%TUcUQ\eUtQTU_dtQ] Q^UtQ8 `Ub Qx^aeUTQRQZU,` TUbYfU^SR\UTUceSQbsSdUbf\{i]Q\W^%aeUS^dYxQdTQfuQU^ce TYQcU^dQT TUce `QTbU'6X bQRYU^%cYQTYc` cY5%^YYTYbU5qQTUqQ,XYZQQ|QbiX ^bqbQce`QTbU%U^dTc\cQRceUfU UhSecQcQ^dU 9Y_c%_bce VKQSQc_TU UZUKSUbUVUSdfQj U^dU UcdQcTYc`_cYSY_^Uc XQSQt\%aeU9Y_c kUaeYUkU%TURU UcdQbU^e^QTU UcdQc SeU^dQc' #\$MQcUQ%aeU bUc`_^TU i Se] `\U\Q_bTU^ DUb_ Ucd_ ^_ Uc Qcu`_b\Qce`_cYSW^4`_baeU__bTU^QT_ Uc U\ Q|_bi_U,X_^bTU.ce`QTWTYW_'GYU,S_]Q^T_cUQS_bUSd_i_Zecd_%6_]_cU.ce`_^U%QS_^dreQSw/%cU_R\\\Q_ fYboleT R ^TQTU^ceTYC` cYSYw^Y*TYbUSqQ%aeUUcUaeYfQU/dUQ\QfYboleTbUaeUbYTQ4iQcucQ,T c S e^dUbfQYkcTUH\$%;\ S]`U^cQ\Q\QqQTUU\\Q`DUbUc dQ`RYL^UcS^ddQYQ\Qce`c'SYW^@QTYL`cYSW^X7ZdXU^U]scaeUTUe^Q\BUQSW^ $S \sim U, TYCUD + U, X \sim B\% \sim dUCUR \sim TQTU^t \% QDQS \sim dDDDDCdQDQQDTU, BUC`UD \WYQ,`uQ BUAeUDYT'$

@\\rutator T∪\Qrf_\e^^tor ?_ ^QX\Q^^: Tg\Q\$Tc

9 U XUSX_ dQUC UCVEUIG_c `eUTU^dU^Ube^QY^WeU^SQ ^UWQdfQReU^Q : cQc S_cQc%aeU ^_dU^U^fYbbeT `_cYdfQ%_dU^U^
^YWe^QY^WeU^SQ]_kQ, `_cYdfQ4cY^U] RQbW_% eUTU^cUb_SQcW^TU\Qc `Ubc_^Qc UfYdQ*T_QWe^_c] QUc `_cYdf_c' 8_]_cYe^
X_] RbU VeUbQU^U\QWeQS_^e^fUSY_Q\QaeU def_\Q] QQf_\e^QdT% aeU ^_cQRuQ^QTQb%_cdU^*X^T__`_bce] Q^_4UcdU
fUSY_ UcdQRQU^TUeTQS_^t\%kU\X_] RbU Uc dU^dQT_QTUZbaeU cU Xe^TU^i QX_WQ^&`Ub_cU^YWQQSe] `\\bS_^\QdU^dQSW^4
^_`_bQ]_bQce fUSY_%Q`eUcdQTUcTUU\Q]_bQ\TY^Ub_% TURYT_Qce QX_WQ] YU^d_cUTURU`UbTUbce TUeTQA_aeU_XQSU U^
\Q`bUcUbfQSW^TU ce fUSY__\bQX_WQ] YU^d_\%_Uc ^QTQReU^_Q_c_ZcTU9Y_c3cY^U] RQbW_%UcdU] UTY_cUUfYdQ\QSe\`Q
] Qi_baeU cU XeRYUbQ^S_^ddQxf_%cYc\XQRuQTUZDT_YdU^SY_QTQ] U^dU ce TYcY QT_bfUSY_i `UbUsUbs^^ DUb_SeQ^T_
Qd] Y^Q^_c%u^cccTYc`edQcS_^_c SQ\fYYcdQc%^cYcdbdQYd_U^cYSUb_c TUcU_ci UcVeUig_c%6_] __ aeU cUTURU UhSecQb_c
X_] RbUc%TURU cUbQSU`dQT_ `_b9Y_c% S':c] Q^\Wbcd_aeUdVU^\bUc`UsC_UC\EUQ_c UC\EUQ_c UC\EUQ_S_] __bQ_c\CY\eUC\SQTUU_c
TUcU_ci Uc\eUq_ci GSU`dQ%&cd\SGQ\MU\SecQb_U^\QSeU^AQTU_c Uc\eUq_bUg_c cYSUb_c%6_] _ cU\Uc\\Q] Q\sii _c X_] RbUc
XQSU^_aeU`eUTU^% S'dU^\UbU\QS\W^S_^QQW\AfQ_b] _bQ\%Q\W_aeUUc QSU`dQS_] _ ReU^Q\% S_] _dQ\%_] `U^cQd_bQc
QW\A^TU\USd_'

^{*&#}x27;@cYSUBTQT%_]_\Q`QQRbQcUedt(YQQfUSuc%cWYWSQaeU^_XQ] scaeU\QbuQ\TQTTU\Qf_\e^dQTiU.: ^TUCf_eb%_^bbc`Usd_QSeQaeVubs_cQaeUcU`b_vbcQ_WYWQ4cY^^YWe^QS_^c\TUbQSW^TU\Q^QbebQUJQTU\`brSYY__WY%TUT_^TUUcdQf_\e^dQTbuQ\iccebWUSVbd_Uc\eUtj_'GYe^X_] RbUdU^Ue^TUcU_buQ%QcuQTYbuSdQ_YTYbuSdQ`QbQ_RdU^Ube^QS_cQ%_buQJU^ducUuc\eUtjQ^ Tuc`et c TUaeU%cUTYSU cYSUbQJU^dU

@\\RUMDTTTU\Qf_\e^dDTC ?_^QX\Q^^: Tg\Q\$TC

 $\label{thm:condition} TUCU_UCVEUDj_%YY YYWEYQS_CYTUDQSWYTU /QR_TQTTU, `bYSYY_TU /QaeU Q5dkQ%_SeQaeYDbUhSU/UYSQ_TYWYTQTTU /VYYYQU, aeU Q5dkQ 6 cv%e^X_] Rbu aeU uc Qj_QR/U Q/Qj_eZbTU ce fuSY_%aeU ucds UYWdj_i _i _\QYWEYTU _Wi_S_U _CW_XQSU e^YUU_YYWYTQTU _CdQSWYTU TUCUQDi _`b_SebQbce bucdQebQSWYTU /QcQeT i U, fYW_bHi __cw__XQSU e^YUU_YXQSU e^YUU_YXQSU e^YUU_YXQSU e^YUU_YXQSU e^YUU_YXQSU _CYSUbQj_UYUU duYUbce cQeT bucdQebQTQ%_SedY_Qcec UcVeUbj_c fUbTQTUb_c i] shYj_c _CQbQU/_3cUTYSU cYSUbQj_UYUU TUCUQbi _b_SebQbTUc_et c TUU\/Q%_baeU _XQSUTU fUbTQT_bUQj_UYUU4Qe^aeU dQ, fUj_U, bYSYY_aeU Q5dkQTUcTU%_Uc_db_aeU e^YQ_QcYWYfYi UCSQYTQ_cQ4XQRUbfYYT_UYQTe/dbY_S_VUQ%YSUbQj_UYUTUCUQdUYUbce cQeT i fYW_bbUcdQebQT_c% QbQaeUfeUffQQ cec _\QSUbUc_Sbj_YQUc'$

: ^U, `bij UbcUrðiT_%e^X_] R&UcUTSUaeUUc cYSUb_%U^_`_cYSW^Qe^Q] UbQ` &UdV`KUTSUaeUe^X_] R&U TSUaeUe^X_] R&U CQCUb`
`QddSe\QbaeUXQSUb_UhXRXIT_%cY^YWk^TUcU_&UQ_cYU] `\&U_`_cYR\U : ^UcdUx\di__cUrdiT_%cUTSUaeUe^X_] R&U `QQCUb
cYSUb_c%U^_`_cYSW^QUcQTU]_cddQSW^TU\QfYbeT^_ Ucd U^cyi `\UJ U^dUXQSYU*T_\QSeUcdw^TUTURU%cY^Q&UQ\TTUTUQ
fYbbET U^U,Q] Q I ^X_] R&U `eUTUcUbcYSUb_U^U, `bij UbcUrdiT_% cY^U] R&W_%U^UcdUx\di__cUQQ_c_ZcTU9Y_c%aeU
RecSQU^U,S_EQ w^%e^XY w8bdQfY\: ^UcdUx\di__dY_TUcYSUbiTQT%c_\Q] U^dU%XQRbs QW_fUbTQTUQ] U^dUfQY_c__QSU dQR\U
Q_c_ZcTU9Y_c' MUcd_Uc_aeUU^\Q: cSbdebQcU\\Q] QcYSUbiTQT%_UcdTQT%^dUbmQXQRUb% XQ QWe^QS_cQ] sc aeUU,X_] R&U^_
UL SQ`Q TUBUQYQb_aeU^_TUJ eUcddQUcdbS_^UsdQT_cS_^cec cYSUb_cTUcU_ci Uc\eUg_C%UX_] R&Ucds S_] `\UdQ] U^dU
UhSecQT_i QRc_\fYwQ_c_ZcTU9Y_c4cef_\e^QtTSYbdQ] U^dUcUQSU dQ`QbQce UcSbdebQ8i e^Qf_\e^QtTUcVsUbiTQTTU_c
UL SQ`Q TUBUQYQb_aeU^_TUJ eUcddQUcdbS_^USAQT_CS_^cec cYSUb_cTUcU_ci Uc\eUg_C%UX_] R&Ucds S_] `\UdQ] U^dU
UhSecQT_i QRc_\fYwQ_c_ZcTU9Y_c4cef_\e^QtTSYbdQ] U^dUcUQSU dQ`QbQce UcSbdebQ8i e^Qf_\e^QtT_\e^QtTi Uc\eUg_C CYSUb_S_]_
UL d_T__ aeUU^U\ aeUcUblaeYbbTUt\%_bSeQaeYbS_] Q^T_TU9Y_c%\Ub_USeQYd_Q\Q_dQSQcUTUcYSUbiTQTTU_c
TUcU_ci Uc\eUg_C AQ_^ dU^UbfYbbTU - bWy_baeU%s_] _cU_RcUff wQ^duc%; eUTUcUbU^fQ^_TU\Q^dUTU9Y_c%U^SeQaeYbSQc_%
bUS_] U^TQ\$%Qdx\QSUb%_UhSecQ% ^_ d\Udu\U\ USECQ% ^_ d\Udu\U\ UC_CX\US_CYMCQ_Y\\equiv UFSQQ\\equiv OC_Y\\equiv OC_Y\\equiv UFSQQ\\equiv OC_Y\\equiv UFSQQ\\equiv OC_Y\\equiv OC

8_b_Qb_'**'D_b_ dQ^d_cU`eUTUY^VUbt%aeU^QTQU^\QbQ;w^i\Q^QbbQujQTU\QcS_cQcTUc`bU^TUTU\QS_^cYTUbQSw^TUSeQaeYUb
`Uc_]_bQ,U^\QQ^dt\eQS\QcUTUcYSUbtTQT%aeU^_c\|UfQQce`_^UbaeU9YcXQXUSX_^YV\e^Q`b_]UcQ`_cYdf_cTU\QcQfQSw^%_\Q
VVQSQ%_SeQaeYUbd\c_TUQcYcdU^SQQX_bb_%_SeQaeYUbRU^U\xSY_Uc`YbdeQ,aeUcUQ%QSeQaeYUbTUcU_%_bQSY_^Uc%cUUc\eUbjQ%Uc\eUbj_%
_\Q_RUTYU^SQTU_caeUXQcdQQX_bQ%aeU^_d\tau_V\QfYbdeTfUbTQTUbQ_\QcQ^dTQTU\cecS_bQ__^Uc4Qe^aeUTURU]_cce`_^UbaeU
d_TQ\QcYSUbtTQTiU,]shij__WbQT_TU:^TUQf_eb%uc`_c\R\UUcdQbU^`Ubc_QcY^cQ^dtTQT'

@\\rutator T∪\Qrf_\e^^tor ?__^QX\Q^^: Tg\Q\$Tc

GUSSYu^j >

 $\label{eq:condition} $$ Ge'_1be'Q'RUadDTTU(Qf_e'dDT%dDUcS_]_Qd_Y'Q_c XQRQbTU%cUQ'USUcQdQ'QfYbbeTiU(fYSY_%Uc] eSXQc] Q'UbQcS_ddQdQcQ, $$ cU'dT_S_] $$ x^*$$

fYboe_cQ4iaeUSeQ^d_]sc\eUbdU\QY^S\YQSYw^%_b_aeUU\]scQ\UZQT_TU\QY^YYUUb\^SQ%u\]scfYboe_c_U\S_bQ\w^% dQ^d_]sc] Ubblight Un QSd_aeu `b_SUTUTUt \5 GYTURU] _c ce`_^Ub#QNS_^dbQbt_TU_ aeU cU XQTU] _cdbQT_ Q^dUc\$TU aeU`eUTU XQRUbe^^QSd_ TUf \e^dQT U^e^\LcdQT TUYTYKUBU^SYQ4` bUZJ] \\ %LcdUQSd %QcQRUB@f \e^dQT TUBUB] YQ^dU`QbQ` ^UbcU\eUbQTUe^\LcdQT $TUYTYWWYSQW `QQQTQbe^Q`W'_-TWQY_^cuTUe^Q] Q^WQQQS_^dPeQSW^%UcWWYWQW^` bPSYY_cQQYYQC%aeUwdUQSd_ TUdUd; $$ \Upsilon QSW^TU Qf_e^dQT Uc aeU c_L U aeU Qf' bueT S_^C'CdU\%_baeU Ucd_cw_cU \|Uf QQSQR_\%, \Upsilon U'ddQc QQ_U'U'U QU'SU U'AU' Ud_QCUU'U'AU' QU'SU U'AU' Ud_QC QG_U'U'AU' U'AU' Ud_$ e^ucdqt_tuY*TNUduY\$7Q% QcuU^e^ucdqt_tu\\Rubdqt3`QcQSeQ^t_e^qfuj aeu\Q] u^ducu`_^u\éubqtuce uae\\RbY_%aeuiQ^_ f YboleT ^Yf YSU C cYNQS_cQ aeU`eUTU XQSUb\Qf_\e^dQTY{} YU^bDQc aeU d_TQf uQU^e^UcdQT_TU YTYKUBU^SYQ%``_b_dQ^d_TU \Q\YRUbdQT% i QcUQcw\ `qtQcec`U^TUb\QQ5deQ5W^% TUdUg\YQbQd] QbU\Qce^d U^S ^cYTUbQ5W^4QS ^dYeQ5W^%LcdQTUdUg\YQ5W^ Uc aeU c__U\aeUfYtatTS_^cYtdU% ^_`b_SUTUbQ\QQ\$\$Yw^TUc`et.c_TU\QUc\$QQUc_Wt&qTQ`_bS_^cYTUbQ\$Ww^D_b_aeUcUw\ts%Q`QatbTU Ucd_c `b/SfY_c%eUd_T__ aeU cU XQSUTUc`et c TU\Q] U^dU%_bSeQaeYub] UTY_%Lc e^QfUj \\e\UcQTU ce Uae\\\P\\E\\Q YSYYQSWY% dUUU YQTQTU \Q YQxbbQU i QTU \Qf Ybbt Uu f YSY % Uc TWY TU YYW6^ Se\`Q Uu WY' DUb %Swj Uc S\QbQj UYU S ^ddQt/ QUcd U,cU^df e^fUbcQ,TU,QXe] Q^fQT% S ^\Q^ S\w^aeUd\U^U^TUQSSY ^UcfYbbe cQccYSUbQ] U^dU EeUUc%aeU `b_SUTU^TU e^S_bq`w^RYU^TY£`eUcd_i RYU^YS\YQT_4i SeQ^d_] scVeUbdU%|scVIZ_i TUdUd|YQT_%QReU^QTY£`_cY5W^TU\S_bq`w^%] Qi_buc \QcYSubtTQT TU\QfYbobT% `_b_dQ^d_] sc TU ce fUbTQT i TU\QbUQ\fTQT DUb_cYXQi SeQaeYubQSd_%eU cu buQ\fQ^U^e^ UcdQT_TUUae\\\Rb_%\Q`b\j\QfUbQ\Y]UTQdJU\TU`Ub\U5QQY*T\UUb\Y5\Qi\Q\bQTQTTUS_bQ`w%aeU^``eUTUceb\\\bTUSeQae\Ub $aeU ^ dW^U VQ f Y b dET TUS_bQ w^ U^ UV_c ' DQ bQ dU^U be^S_bQ w^ f Y b de_c_% bC dU^U be^S_bQ w^ aeU VQ f_b bUSU VQ f Y b deT% UC Q f Y b Q f Y b deT% UC Q$ aeUceb/\u2^\f\ Un\at\u2\text{UtQTUe^Ucd\tau} \u2\text{UtQTUe^Ucd\tau} \u2\text{VtQTQc_b\Qce_c\subset} b\Qce_c\subset\u2\text{VtQrQc_c\subset} b\Qce_c\subset\u2\text{VtQrQc_c\subset} SeQaeYbbUUSSYM^Q^dUbY_bb_baeu.cY^_Q^dubY_bUUSSYM^9\u^d_^Suc.\Q_`SW^Y^dUbY\u^UU^dbu.U\Q5d_i U\UcdQT_TUYTYKUbU^SYQ4_ $SeQ, Uc S_^ddQbY_Q/Q ce `_cYSYW^TU, QSd_aeU cebWUYY]_UTYQdQ]_U^dUTU/QYTYMUbU^SYQ_DUb_QaeU/_c QSd_c aeU ^_Ucds^TUdUb]_YQTQc$ `_b\QU\USS\\^Q^dUb_b\%_`eUTU^cUbf\fae_c__f\SY_c_%_b`b\^SY`Y_c Qb| Y^Q^Qz%_baeU ^_Ucds^TUdUb| Y^QT_c`_b\Qf_\e^dQT' 9 U ^rcebWu^r] UTQQQ U^dUTU dQ UcdQT_4i `_bUc_ ^ cUXQSUU^e^UcdQT_TU\RUbdQT%GYQQSS%^^ cU`eUTUTUdUg\rQb`_be^QSd_ $\label{thm:condition} \mbox{Qrduby bTU UNUSSW^%J/d_^SUc $$^ \ed{thm:c_4}$ baseU U^d_^SUc \Qf_\e^d{thm:c_4}$ Local UCds $$ \ed{thm:c_4}$ Local UCds $$\ed{thm:c_4}$ Local UCds $$\ed$ XUSX_SYUbd_%aeU ^Yf YbdtT ^Yf Y6U aeU cU`eUTU U^S_^btQbU^SeQaeYUb\eWQbU^U\e^Yf Ubc_

D_b_ddQ`QddV@eUUc^USUcQY_`Qqe^QQSSW^fYade_c_aeUUUQYQacUU^e^UcdQT_TUYYYYUUUYSQWQZ_e^Q_SW^TUaeUU.cub e^UcdQT_TU\\RUbdQT%UcS_^ddQY_Q\cU^dT_S_] x^4i QaeUUce^TYSdQT_TU.cU^dT_S_] x^@eU\QYYYYUUUYSQU\cu%U^] eSX_c SQc_c%UcfYSY_c_% `_b_dQ^d_U^e^Qd_WQQT_'8_]_cYSeQ^T_fU_Q] YfUSY__e^Q] \\W_SUbSQ^_% aeUdU^UU^U\U] sc Qd_ WQQT_] UUUSYT_TU] \\%\U^\QQ^WecdQUhdbU] Q% _b`UdUSUB%UYSeU^db_e^QYYYYUUUYSQU^] \\YS_bQ\ w^S_^\UC\USd_QSeQaeYUb S_cQ @\\#Uadot TU\Qf_\e^dot ?_^QX\Q^^: Tg\Q\$Tc

`b_`eucd_`_bXQ\$Ub%aeU`eUT_ XQ\$UbVs\$Y[U^dU% QbQce Q\fY_'6cuaeUcYXQ; aeU] U`b_`ec_ U^R\QcVU] YQ: S_^dbQ9Y_c%
_] QdQbQ] Y`QTbU%_XQ\$UbY^e] UbQR\Uc_dbQ: S_cQc%aeU`_TbQ^cUb] U^\$Y_^QT_c4\QY^TWUbU^\$YQ%_be^]_] U^d_%cUbQ
] ei fY\$Y cQi fY{

M.cu` eUTU Rcutif Qt%QTU] sc%eU Q.ce` ^UbucdQ\\RutaQTTU\QY*T\WUU^SQQ \Cuc\Ucu^SQQ\Qf\tateTi U\f\SY %TUcatei U\Q\WQ^ f YadeT U^Uf YQQL_c%_ f YSU U^XQSUbQc' GY^U] RQbW_% QxQaeU\Q] U^dU Ucdt U^e^UcdQT_ TU Y^TYXUbU^SQS_^bUc`USd_QU_c%ub UcdQb Q\QT TUXQSUBQc3U^d^SUc Uc YYYYYD] U^dUSUBQTU\QU\USSWY% QcuS] UdUbU\XUSX % baeUU\UaeYRBY Uc U\cYVYYU^dU`Qc Qe^ \\WQT_TU`\bU`_^TUbQX_^4ie^_%^S\ec_U\]sc]u^j_ \\WQT_TU`\bU`_^TUbQX_^#\$_^c\TUbQY__dTQc\Qc.S_cQc\$Uc\QU\USSW^M_ $\text{cw}_\text{Ucd}\%^{-} \succeq \text{hQf}_\text{e}^{-}\text{dQT} \top \text{U} \text{Ucd}\text{bU}^{-}\text{e}^{-}\text{Ucd}\text{U}^{-}\text{T} \top \text{U} \text{Ucd}\text{bU}^{-}\text{e}^{-}\text{Ucd}\text{U}^{-}\text{U}$ ^QuebQNj QTU\Qc S_cQc%LbdQ^^ b_`U^c_c QS_] UdUbU_c% QaeU cU QRcdU^WQ^TU U_c4oTW^TU Ucds \QQdb_SYTQT ce`UbY_bTU\Q $\underline{d} \ \underline{U} \$ i /Qc/\ui \uc TU e^QS_^d/\Wu^^\$QdQ\%cU` eUTU \uc` \ubqb\%_] _ e^QS_^c\useu\^\$QY^Ui`\qR\\UTU e^QT\c`_c\s\w^TU S_cQc\%eUTURU] _c $\label{eq:local_local_local_local} $$ U_W = \sum_{i=1}^{N} U_W = U_X = U_$ S_{c} CUSeU^SQ ^QbbQ, TU/QYWbQTQT TU/QdU^TU^SQTU/QSQccQ%_ TU, UcdQT_ Q^dUSUTU^dU TU S_{c} CQ: TU/Q: aeU cebWu U, UVUSd_' oD_b aet U^d ^SUc TURUbuQ] c cUbdQ^ UhSUcYfQ] U^dU\Q Se\`Q%cY\ XQSU SQUb5

McY`_TUbTU Qed_TUdUd; YQ\$Yw^U^U\cUbs ^U\$UcQbY_]_bQ,6WU^\$YQ%QQQRQY; Q%Q \$e\'Q% \$' U^d_^\$Uc ^QTQ XU\$X_`_b\Qf_\e^dQT 'eUTU cUb\$eQaeYub] sc _QR\U__\$U^cebQR\U\\$TU\Q] UTTQ U^aeU\Qf_\e^dQT cU] eUf U%cU RQQY\$Uw% cUTUdUd; YQ`_bcu] 'k]_% \Qc Uc\$QQC \$_^f UdbT_c`_bU\`_TUbc_RUbQ^_TU\Qf_\e^dQT dU^Uc_RbU cu] 'k]_' M`_b_ dQ^d_\Qf_\e^dQT ^_TURU Ucdb\veUbQTU ce Uae\YRbY_% bU`_^TUbQ\Y_^_TURU cUbTUdUd; YQTQi U\U\$dQQ\duc TU] Q^_4i QcuU\Q\$d_TU Qed_\$TUdUd; YQ\$W^TU_` bUf Ycd_'6cu Q`QbU\$UTU_dbQ] Q^UbQ%aeUU\cUcW_XQRYbeQ,Uc Y\$_] `Q\$R\U\$_^aeU\Q\\RUbdT%aeU\Q\\RUbdT%aeU\Qd; Y^Q^_c ce`_^U aeU cUb^\U\$UcQbY_f YbbET_U\fY\$Y4i _aeUcUTUTUF\$U%aeUU\,b_`Y_cucW_XQRYbeQ,^_`eUTU cUbfYbbe_c__ f^\$S_c_'

@] '*] _ cUTUC` \$U^TUTU CE T_SOMO QSUBSQTU/Q^USUC*TQT TU '\$S_^C*CUI^\$DQS_^@RUDI %QQRQY) Q% U^_c` \$U\$Y\% S' BYW&^_` eUTU CUDOQ^\&UDIUS_] _ `QDQCUDYF U^\$R\U% ^_ TUZQb^YW&^Q`_c'RY\TQT TU TUDUD] YQD/Q f_\@^QDUCYTQT' S_^\QQUCUDQUIYTT_ S_^\Q^\QUUCYTQT'

@\\rutator T∪\Qf_\e^ntor ?_^QX\Q^`: Tg Q\$Tc

I _POYLOL LANGOSSW., D P/ aen, CARRAyeen J. M.K., rarpsel Langos C x s kiq c.e.

I POYLOL LANGOSSW., D P/ aen, CARRAyeen J. M.K., rarpsel Langos Lang

6aeucyQWeyn,tuknitonaneendo,rcomortagen olocomortagen olocomortagen olocomortagen orango,rcomortala, prenn,niocof mony?] Brn/ki
6aencyCwentuknitonaneendo,rcomortagen niocof olocomortagen olocomortag

Qbab/SU4 \QR ^TQT i \QTe\jebQTU\ c\Vbed cTU e^ZQ5Tv^c ^f\VbetTuc] bQ\Uc%`YU^T \ cUVUSd cTU\ cQSd c\\RbUc i \Vb(\Uc TU\, ZQ5TY^Ub ' GY\Q $\label{eq:local_condition} $$ \arrowvert = (\arrowvert \ \arrowvert \ \arrowvert$ U^W6Q^] UTTG4U^d_'SUc_^ XQ; UVUSd_c ^USUCQb_c U^QRc_\ed_%TUXQbaeU \QSQecQcUQ ^e^SQ dQ^ReU^_] Q_% eUTU cUbf Y6de_c _ f Y5Y_c_4 `Ub \QfYbdeT U\fYsY TURU cUbcw\ U^\QSQecQ\YRbU 6WbQTQR\U] U^dUQUcd%u\9bK XYbRi ce` ^U%Q^USUcYTQTTU aeU QcYcdUQ\ c XsRYd c $ReU'_ci]Q_cTU_ccQ'd_cU^U,SUU_\%S_^TU^QT_cU^U,Y^WUD^2\%eUc_^QS_cUSeU^SQTU cecQSd_c \label{eq:ci}ReUU_ci]TU_VRUDDT_TU_WRUDDT_TU_VRUDDT_TU_WRUDDT_TU_VRUDDT_TU_WRUDDT_TU_VRUDDT_TU_WRUDDT_TU_VRUDDT_TU_WRUDD_TU_WRUDDT_TU_WRUDDT_TU_WRUDDT_TU_WRUDDT_TU_WRUDDT_TU_WRUDDT_TU_WRUDDT_TU_WRUDDT_TU_WRUDD$ S ^TISY ^Q%' c ^bu5] `U^cQR\U SQcdMQT': ^WU^UbQ\@QU5U\@eU cY\Qc ^ SY ^Uc TU.Qdj Y^Q^ c buQdf c Q\Q\RubdQT i \QQ\W\SQ) bQ\cub $fUbTQTY%QQcUWeY$\%aeU^XQifYbbeTU^SeQaeYbbQTUUcd_cXsRYd_c_SeQYTQTUcS_]_VQXe]YbTQT%Q]Q^cUTe]RbU%Q^QSYU^SDQAQ^YbTQTWQD_cXsRYd_c_SeQYTQTUcS_]_VQXe_YbTQT%QQQQCUTe]RbU%Q^QSYU^SDQAQ^YbTQTWQD_cXsRYd_c_SeQYTQTUcS_]_VQXe_YbTQT%QQQQCUTeQTWQD_cXsRYd_c_SeQYTQTUcS_]$ WKQtddeT%QWU^Ub_cYTQT%TUUc`ubdeSU\UcdQA^QTQU^QRc_\ed_TWY_TUUL_WY_U^U\Q\Q|_bTU8bbcd_`_bU^Si] QTU`QTUI;] QTUU%Uc`_cQUX\Zc% _^eUcdbQ`b_`YQfYTQ4_TU`YQSUbU^YQcQ^dTQT%YQ]RbUicUTTUYQZecdBYQ%bYQ]_bQY_cU^UJYYY_c%QRU^Uf_YU^SYQe^YfUbcQ;QYQXe]Q^YTQT%;% `_b_db_\QT_%_XQ;^QTQU^QRc_\ed_f\BY_c_%_TMY_TU]U^_c`bUSY_%U^\Q]sccwbTNTQ%RUcdQ%]Q\WY_%TQRw\K_`\Q74U^cUbTUcQWbQTUSYTQ% `b_VQ^%XQRXBeQ}U^dU_TYQbQ9Y_c%\VQcS_cQccQWXQTQcicQ^dQc4_U^cUb]scdbQ6Y_^Ub_%V/YfYY_c_iSbeU,XQ5Q_cX_]RbUc'D_bd_TQcUcdQc $S_cQc_c c_^TC_c S_CQC_c TUCUYSYCQC_CTUVS_EQW^MMMU^TUWYMFQ%_XQC_QQS_]_e^QSeQWTQT_f Meb_c__f S_CC_TUVQ] \ UVOU4XQCQQC_CTUVC_CTUVS_EQW^MMMU^TUWYMFQW^C_XQC_QQS_]_e^QSeQWTQT_f Meb_c__f S_CC_TUVQ_CTUVQ$ S_cQS_]_f16abTYXUbU^dUi\QcQ^dfTQT%_U,f16Y_iU,`U5QT_4iU,]sc\eUbdUUc_cXsRYd_c_TYć`_c16Y_1Ucc_^%_aeUc_\uQcUb\\Q]QT_f16ab_c_ if16Y_c_%seQ^d_]sc\uZcucols^TUcubol0^UkU5olfQ]U^du4_cTUcU_cTU_cX_]Rbuc]scfY_\U^d_c%|sc\wZce_bMe_%QU^f\inQ%^WbQobbeTi] Q\f\$Q%\f\rac{v}_U\] sc c_^aeUTUcUbSU^cebQR\U GYXQ e^X_] RtUaeU`_bcec`b_`Y_c Q\$d_c tU`U\$ff_c%_`_bSeQaeYUb_db_] UTY_%XQ\\UWQT_Q $\verb|cubTU|QTt'|_c S_{N}^2 | sc YVbb'Q\%TUcUc' UtQTQ| U'dU Y'S|YQT_Q dtQdbQcec f USY_c S_{YZbb'_ec''Ucc'%M, TUc' tUSY_i | Q] Q\WYTQT4SeQ'd_] sc YUbY_Q\U'dUc' UtQTQ| U'dU Y'S|YQT_Q dtQdbQcec f USY_c S_{YZbb'_ec''Ucc'%M, TUc' tUSY_i | Q] Q\WYTQT4SeQ'd_] sc YUbY_Q\U'dUc' UtQTQ| U'dU Y'S|YQT_Q dtQdbQcec f USY_c S_{YZbb'_ec''Ucc'%M, TUc' tUSY_i | Q] Q\WYTQT4SeQ'd_] sc YUbY_Q\U'dUc' UtQTQ| U'dU Y'S|YQT_Q dtQdbQcec f USY_c S_{YZbb'_ec''Ucc'}M, TUc' tUSY_i | Q] Q\WYTQT4SeQ'd_] sc YUbY_Q\U'dUc' UtQTQ| U'dU Y'S|YQT_Q dtQdbQcec f USY_c S_{YZbb'_ec''Ucc'}M, TUc' tUSY_i | Q] Q\WYTQT4SeQ'd_] sc YUbY_Q\U'dUc' UtQTQ| U'dU Y'S|YQT_Q dtQdbQcec f USY_c S_{YZbb'_ec''Ucc'}M, TUc' tUSY_i | Q] Q\WYTQT4SeQ'd_] sc YUbY_Q\U'dUc' UtQTQ| U'dU Y'S|YQT_Q dtQdbQcec f USY_c S_{YZbb'_ec''Ucc'}M, TUc' tUSY_i | Q] Q\WYTQT4SeQ'd_] sc YUbY_Q\U'dUc' UtQTQ| U'dU Y'S|YQT_Q dtQdbQcec f USY_c S_{YZbb'_ec''Ucc'}M, TUc' tUSY_i | Q] Q\w'YTQT4SeQ'd_I | Sc YUbY_Q\U'dUc' UtQTQ| U'dU Y'S|YQT_Q dtQdbQcec f USY_c S_{YZbb'_ec''Ucc'}M, TUc' tUSY_i | Q] Q\w'YTQT4SeQ'd_I | Sc YUbY_Q\U'dUc' U'dU Y'S|YQT_Q dtQdbQcec f USY_c S_{YZbb'_ec''Ucc'}M, TUC' tUSY_i | Q] Q\w'YTQT4SeQ'd_I | Sc YUbY_Q\U'dUc' U'dU Y'S|YQT_Q dtQdbQcec f USY_c S_{YZbb'_ec''Ucc'}M, TUC' tUSY_i | Q] Q\w'YTQT4SeQ'd_I | Sc YUbY_C S_{YZbb'_ec''Ucc'}M, TUC' tUSY_i | Q] Q\w'YTQT4SeQ'd_I | Sc YUbY_C S_{YZbb'_ec''Ucc'}M, TUC' tUSY_i | Q] Q\w'YTQT4SeQ'd_I | Sc YUbY_C S_{YZbb'_ec''Ucc''M}M, TUC' tUSY_i | Q] Q\w'YTQT4SeQ'd_I | Sc YUbY_C S_{YZbb'_ec''Ucc''M}M, TUC' tUSY_i | Q] Q\w'YTQT4SeQ'd_I | Sc YUbY_C S_{YZbb'_ec''Ucc''M}M, TUC' tUSY_i | Q] Q\w'YTQT4SeQ'd_I | Sc YUbY_C S_{YZbb'_ec''Ucc''M}M, TUC' tUSY_i | Q] Q\w'YTQT4SeQ'd_I | Sc YUbY_C S_{YZbb'_ec''Ucc''M}M, TUC' tUSY_i | Q] Q\w'YTQT4SeQ'd_I | Sc YUbY_C S_{YZbb'_ec''Ucc''M}M, TUC' tUSY_i | Q] Q\w'YTQT4SeQ'd_I | Sc YUbY_C S_{YZbb'_ec''Ucc''M}M, TUC' tUSY_i | Q TUS$ $\text{cUTURU'} \cdot \underline{\text{b}} \text{ fU''bTU SeQae'lbTt'} \cdot \underline{\text{c'lSfw'}} \text{QUcdQbU'} \underline{\text{ZQT}} \cdot \underline{\text{S}} \cdot \underline{\text{t}} \cdot \underline{\text{w}} \cdot \underline{\text{U}} \cdot \underline{\text{U}} \cdot \underline{\text{V}} \cdot \underline{\text{U}} \cdot \underline{\text{V}} \cdot \underline{\text{U}} \cdot \underline{\text{V}} \cdot \underline{\text{V}}$ `Ubc_^Q%aeUUc]scTUe^UhSU,U^dUUc`ubde%t\cUYS\YQ\eUbdU]U^duQ\QcQSSY^Uc]scQ[QR\Uc%QT]YbQR\U]U^dU]Q^c_c%RU^tf_\%S'`_b _dQ^d_Uc]scaeUTUSeQaeYbbS_cQ_bUS_]`U^cQR\UU^S_]YQR\U:^\QaeU_c`bYSYY_c%u\X_]Rbu?UceSbbd_UcdQRQ]ei\UZ_cTUcUb] UbdjbY `QbQ_c Qsd_c TU\QcQ^dfQTi \QR_^TQT aeU\\UfQQSQR_%Ub\&UbdU\U^ce S_bq\w^UcdQc `b_`U^cY_^Uc' M%_RbUd_T_%U\9Y_c YYYYDD UYUU CQYD I WUY_TU WQGQUUC YYYYDD UYUU QUIQIT_TU SeQaeYUDS_CQ_QRWYGYUY_YYYYDD UYUU VEUbdU cec ReUYQc YYSYYQSY_YUC% aeU% `_b_ dO^d_%Q\QTY5dO^SQ] shYj Q`_cYR\UTUUcdObU^\YRUbdOT MU^d_T_c_c SQc_c%j sc \&UbdUc cUbs^\Qc Y'S\YQSY_^Uc TUSeQaeYUbQUcds Q\Q f*bbet7% SeQ^d_]sc_Q]Q^%|U^_cf*bbe_c_% SeQ^d_]scQ]Q^\Q]QTQT%|U^_cf*bfy_c_aeUQbU&YUcdQcS_cQcUcds^TUQSeUbT_S_^\Q : cSbbbbb2@eUSQTQSbbbdQ^% SQTQX_] RbUaeUXQ\UbT_\Q7'R\\D9%eUj3i cYUbb^TUQSeUbT_S_^U,cU^df_S_] x^%eUSQTQe^_TU_cZeUSUc% U^\RUbalDT M U^d T_c\cSQcc%; sc\eUbaltcclbs^\QcYS\YQSY^UcTU SeQaeYUbQUcdsQ\QfYbabT%; SeQ^d] sc_Q]Q^%; U^cfYbab_c% $\label{eq:continuity} $$ \operatorname{VOT}_{Q7}^{N}^{\circ} : \operatorname{CVLot}^{T}_{Q} : \operatorname{$ X_] RLU/% UceSbicd_% LcdRQ] ei \LZcTUcUb] Ubd_bY_\QbQ_c Qsd_c TU\QcQ\dfQTi \QR_^TQT aeU\\\LQQSQR_% Lcdc `b_`U^cY_\c\c\tau_c\c\tau__\ebbar U^ce \$_EQ; w^ M%_RbJd_T_%U,9 Y_c YYMDQ; U^dU cQ^d_i | \\U^_ TU WKQ5QUL YYMDQ; U^dU QULQT_TU \$eQaeYUb\$_cQ_QR\U%\U^T_ YYMDQ; U^dU $\label{eq:local_control_control} $$ \end{cases} $$

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GUSSYi^J ≯

~_ QSSY_^UC_Q1| Y^YQ^QC_TU\QQWU^SYQ] _ LQ, Y^S_] ` QMR\UC_S_^ d_TQ\QYY\leU^SYQTU\] _ df_ i \QY*TeSSY\^% QcUQU^fYbb_c_c_c

C cYQWe^_`YUrcQaeU] sc Q`b_`YQT_TUSY%aeU\c]_df_c ^_QdUbQ^\QYS\YQSW% TQ^e^cUcW_^Ud_Q\Q] UrdW%_
QdUbQbs U\SQc_%U^SeQYd_Q\Q\S\UbUrdUTYCSecYW^D_baeUcYA_df_c_`UbQ^TQYT_Q\Q] UrdUe^QYYS\YQSW^%UYd_SUC U_c
_`UbQ^] UTQYdU\QTUcdbeSSW^TU\QYTYWUUYSQTU\Q] UrdU%``_nf_T_L_RQZ_e^cucW_DUb_`QbQXQSUbUcd_%Uc TUcdbeYb\Q
\\RUbdQT 6bj\Y^QYQ8^_cUdbQdQTUTUZQb\Qf_\e^dQTTUce`b_`YQQed_8TUdUdj\YQSW^% Ub_Q_`___YW_U^U__TUbTUQW_
\UbdurcUS_%aeU__`UbQc_RbUU\Q%cURQQYSUQi TUdUdj\YQaeU% bUf\QQce`b_`YQTUdUdj\YQSW^* 6cuaeU_ aeUcUXQSUTUcTU

]_df__%_`eUTUaeUcUQfYdde_c__fYSY_c_'6TU] sc%xY_c QSd_c TU\Qf_\e^dQT_c_^UbSdQT_c`_bA_df_c%_c]_df_c c__\Qc
SQecQcTU_c QSd_c TU\Q4_ aeUXQSU aeU_c QSd_c TU\Qf_\e^dQT_USUCQbQ4S_]_ UVUSd_c CWeU^^USUCQbQJ\UbQf_\e^dQT%
TU\QSQecQ McY\QYY\eUYSQi U__TUbTU\]_df__XQSU aeU\Qf_\e^dQT%UYd__SUC\QYY\eUYSQTU\]_df__TUdUdj\YQ\Qf_\e^dQT%
i \Qf_\e^dQT__TUdUdj\YQU^cu4i `_bdQYd__ Ucds \\RbUy\Ub\Ub\Ub\UbQ\USTU^UCU

@@.ce`_c'\$%^TU.aeUiQcUXQTQT_SeU^qQTU.aeUe^QUfQc;\w^`Yce\\\$\U^dUU^_do_c SQc_c%cUbuQ%TU\\\eq\] Q^UbQ%

'ij` `Ubd^U^dUQ\UMQT_U^UcdUSQc_4QcQRUb%Qce`_c\\$\w^TU.aeU\Q\\RUbdQT S_^c\cdU^U^e^`_TUbTU.cec`U^c\w^TU.Q\$S\w^`
`QtQU\`BUcU^dU%6 ^U,\\Y^TUTU\RUbQ\$\w^'G\XQi_aeUTU\$\\%

+ GYNEUTO QCUMBEU d_TQf YateT i U\f YSY_%U^d_T_c_c SQc_c%_^cYcdwcw_U^U\QSd_TU\Qf_\e^dQT%___aeUTUdd; YQcYcUTURU $S_{C}TUUD_{C}_{C}$ QdutQauQu\SQc_U^_] sc] u^ij _% QaeU XQcdQu\`bucU^d Qbd\] U^d U\Qf_\e^dQT_U^d \DQxQQx^U^ucdu Qbd\] TU\Qf_\e^dQT U^U UcdQTUddd; YQSWY%aeU Uc YTeSTQ`_bQWx^] _df_% cYMeU^USUcQbQ\] U^dU U\] _df_] sc \eUddU4i dQ\] RYL^_ Uc ^USUcQbQ\] U^dU% YS\ec_ U^UcUQSd_U^U\aeUc__Uc i QcUQfYate_c__fYSY_c_'

 $I \cap QS_{CQ} \text{ sc aeU}_{C} \text{ GWD/SW} \cap S_{C} \cap QYS_{C} \text{ CYC} \text{ TU} \cap QS_{C} \text{ GWD/SQ} \text{ LQ, } S_{C} \cap QYWeD/SQTUA_dYU.$ $\label{eq:ce_wall} $$ c'_W = U'' \wedge W'' = (C'' - W'' - C'' - C'' - C'' - W'' - C'' - C''$ i U^qQUc St5e^cq2^Sq2;fU^qQZ_cq2%_]_cUbYfU^SR\U4i S_]_\Q]U^qU^_`eUTU cY_SUTUbQ;^^UcdUSq2;_%_cQtj Y^Q^_cT15s^%_YTETQ%Q \RUbdQT cUTUcdbei U McYUcQcs%U^d_^SUc%Y_c]_df_cc_^UhXRYT_cS_^\Q] YdQTTU dQ^d_`_TUb%aeU_RcdQSe(\YQ^\Q\RUbdQTU^`b_`_b5W^Qce \eutig Q% cUf Q^Q] \tdpTTUSQ] \tag_XQSQ ce TucddeSS\w' GYe^] \\\QbTU\\text{WQT_c TU\\RUbdQT_c TU\\RubdQT_] \df_QR_\\bd_TQc\\b\d_TQc\\b\d_Suc ae\tagY\U'\d_c d_] Q\b_] \UT\Q $TUTCdQ^{SQ} GYe^{WKQT} TUVQY^{WeU^{SQ}TU,1} \underline{df}_{\sim} c^{WWMSQ}U^{QRC}\underline{ed}_{\sim} YWWU^{QYTC}\underline{df}_{\sim} C^{WWMSQ}U^{QRC}\underline{ed}_{\sim} YWWU^{QYTC}\underline{df}_{\sim} C^{WWMSQ}U^{QRC}\underline{ed}_{\sim} YWWU^{QYTC}\underline{df}_{\sim} C^{WWMSQ}U^{QRC}\underline{ed}_{\sim} YWWU^{QYTC}\underline{df}_{\sim} C^{WWMSQ}\underline{ed}_{\sim} C^{WWMSQ}U^{QRC}\underline{ed}_{\sim} YWWU^{QYTC}\underline{ed}_{\sim} YWWU^{QRC}\underline{ed}_{\sim} YWWW^{QRC}\underline{ed}_$ WKQT_c4`_b^QTQTU\T_R\U%\Lcd_TQfuQ^QTQ`McYT_cWKQT_c^_T\cd_Y\eiU^\Q\\RUmdQTTU\Qf_\e^^QQT\%_] sc XQSUbSeQb % SX_%T\USY\ct \cdot\% cU\cdot $\label{eq:control_control_control} \begin{tabuling} \be$ \$_^dtQ\Q\\RUbdQT%Q\$_^dreQ\$%\^%U\,] U^_bWbQT_TUaeUTeU\UU^Q\\k\^\WbQT_4i`_b\$_^c\\Me\YU^dUT\c] YeiU\Qf\\bdeT'GYA_dtf_c\YfU^\$R\UcQ_c ወንሷ] ሆ_c \Qf YbbET4i U,] sc Tt R\(TU_c] _df_c c _ ^% ሀጀይኑ` QbQ \Q SQecQTU\Qf YbbET4i ^Y \We^_ Uc _] ሀጀ bTUሷΤ_' DQbQ ^QTQ%\^ Uj RQb\\ \$_^d^eQ\$\w^%\u,\] Q`_b\\\\QTU\Q\$_cQ\\6_^teUTU XQ\$U\bTQ\z_\\RU\adQtr DU\b_ cYXQ; Q\\W_cUQ\\u)^\Q^QaebQ\Uj QTU\Q\$_cQ\\6_^dbQ\Q\\RU\adQtr\\Q @\\RubattrTU\Qf_\e^attr

EeUQX kQcUS^cYTUbQ%cYUcdQcScQcUcds^TUQSeUbTS^U,cU^dfS]x^GYcUTURU`Ub]Ybb%aeUXQiQ,We^cSQccU^aeUU, Q] QUYWU cY`^YWk^] _df_%QfYbbtT aeU`eUTU XQRUbU^UcQ UUSSW5: cd_i cUWeb_TU aeU ^_ XQ `beTU^SYQ_ cQRYfebuQ U^t \' 9 'SXQ U\USSW^cU XQSU`_b^YW6^Q ReU^Q \WQ4c'YU^T_ XUSXQ`QxQ ^YWk^\W^U^QRc_\ed_' GYV6UbQ`QxQ SeQaeYUb\W^%Q f YcdQTU\ UhddU] cUbaQUJ] df U] SY ^Q^dU`QQQU\QSd 4i cYUJ\QSd cUQTUReU^\Yr% QcuTUcTU\QQecU^S\QTUReU^Q`e^dUbaQ%U^d ^SUc ^_ XQi ReU^Q\^du^S\w^U^U\Q4i%_b_dQ^d_%TU QSeUbT_S_^d_TQc^eUcdtQc^_SY_Uc^QoebQ\uc TU\QfYbbeT%\^] scfYbbeT U^U\Q $aeUU^1U_1]_fY_1^1V_2^d_TU_1QXe]_%eeUU^1_Y_ecQT_XQSQQTUQ^dU_1Qdbsc`_bU_1fY_2^d_%cy^^vMk^_RZUdf__W^1U^1_]_fY_0^M_aeUU^1_1Qdbsc'_bU_1fY_2^d_Wcy^^vMk^_RZUdf__W^1U^1_1_fY_0^M_aeUU^1_1Qdbsc'_bU_1fY_2^d_Wcy^^vMk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^^wMk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^^wMk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^^wMk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^^wMk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^^wMk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^^wMk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^^wMk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^^wMk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^wMk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^wMk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^wMk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^wMk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^wMk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^wMk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^wMk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^wMk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^wMk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^wMk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^wMk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^wMk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^wMk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^wWk^_RZUdf__W^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^wWk^1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^W_1U^1_1Qdbsc'_bU_1fY_2^d_WCy^W_1U^1_WCy^W_1U^1_1Qdbsc'_bU_1fY_2^d_Wcy^W_1U^1_1Q^0_WCy^W_1U^1_1Q^0_WCy$ ^_ cQRUQTwTU%Y`_bdQ^d_%eUcU] eUfU 8_b_\QX'*' D_bUcdQ: S_cQ: aeUQ`QUUSU%eUU\QXMe] U^d_U^S_^ddQTU_c $SQFY^*CQC^*M_1$ $QT_TU^QCMYQSW^TU_cS_CUZ_c^*M_1X_MQSY_UC^*M^FMQSY_UC^*M_1S_FU^SY_UC^*S_FU^SY_UC^*M_1$ UNUS_d_%aeUU\,]_df_aeUU^\U\Qc.cUUhXRUUYTeSSYv%aeUdU^TUQUhSdQbi TUdUdj Y^Qb_c QSd_c TU\Qf_\e^dQT' GY^Uj RQb\U_%U $\verb|cyMeU%U^cec'| b^SY Y_c\%eU \le QSd_c TUf_e^QT UhSYQT_c' = bUcdQc SQecQc\%_' eUTU^cUbf Ybbe_c_4` baeU\%QcdQQX_bQ\%QaeU = bCMC_c' bCMC_c'$ c $^TUUcd c\%$ c TUU $^TUDTU Qed TUdUdj YQSW^TUVQF Ve^dQT' D bV <math>dQ^d \%UcYWeU^{\%}eU^{ }fQUVQ`U^{ }UVQVW^{ }VUSUb ^{ }YWK^{ }$ Q\$M\$] U^d_`Q\$Q\$_^fU^SUbQ_c X_] R\$Uc Q\$eQaeYUbf_\e^Q\$T fYbbe_cQ_ Q\$\$Y\^f_\e^Q\$Q\$Uc U^fQ^_TU`_^UbUU^U\\$Q] Y_ TU\Q $S_cQc `eUTU^\Upsilon TeShb_c QV_aeUUc] QdUbQ] U^dUf Ybbe_c _%\Upsilon U] RQbW_%Q,] Yc] _ dUJ `_ aeU VU aeYdQ VQ V_bJ Q TU VQ f Ybbe T% _baeU VQ AeUUc] QdUbQ U AeUuc] Q$ TUcdaeiU^\Q\\RUdatQT4iQaeU%_bce`b_`Y_`_TUb%_^U^\Qf_\e^dQTTU ce Uae\\\RbY_%TUddj\YQbiS_^fUddb\QUcSQQ% d] QbU\ dtQRQZ_TU`_TUbTU Qed_TUdUd; Y^Q\$Yw^TU cec] Q^_c' M\Q] sc \$\QtQ\Qc Y^cdte\$\$Y_^Uc TQTQc%_c] sc `_TUb_c_c _c Q\$Me] U^d_c edity QT_c% SeQ^d_] sc cU] eUFU\Q`UtaceQcYk^_ UZU] `_c% sc `b_RQRYNTQTUc XQi TU aeUTY£Y`Qbce `b_`Y_TY£UV_4`_baeUdtU^U^ $d\Omega'd_{\rm s} = \frac{1}{2} \int_{\rm s} d\Omega' TU'SQQ' - \frac{1}{2} \int_{\rm s} d\Omega' TU + \frac{1}{2} \int_{\rm s} d\Omega' + \frac{1}{2} \int_{\rm s} d\Omega$] Y:] QTU\QfYboeT% \Qucu^SQTUdT \ aeUucTYW TUU, WY'

 $\label{eq:condition} 6 \text{cucUTUTeSUSQQ} \text{ Undb}\text{QU} \text{ Qadb}\text{TUUcd}\text{ c} \text{ `bhS}\text{Y}\text{y}\text{c}\text{`eeU}\text{9}\text{Y}\text{c} \text{ ^ db}\text{U}\text{`}\text{Y}\text{dab}\text{TTU}\text{QW}\text{`}\text{-}\text{\%YdQ} \text{`}\text{`}\text{-}\text{S}\text{ U}\text{`}\text{QRc}\text{_}\text{'ed}\text{`}\text{`b}\text{]} \text{ eu}\text{FU}\text{`\%}\text{Q}\text{cUQ}\text{`}\text{-}\text{b}\text{ }\text{C}\text{-}\text{cucUTUTeSUSQQQ} \text{`}\text{-}\text{cucUTUTeSUSQQQ} \text{`}\text{-}\text{cucUTeSUSQQ} \text{`}\text{-}\text{cucUTeSUSQQ}$ $e^QYVVeU^SQVuC^SQ_] = bQAaeU^YVVe_TU_c]td_Tc] = bQUcaeUed(YQQ_cX_]RbUc^QD_b] = fUbVQfYbbeTU^U_l = e^T_%bUr^UdU^TU^SQQ_l = e^T_%bUr^U_l = e^T_WbUr^U_l = e^T_WbUr^$ \QS_^cU5eS\%^TUUcU\%^4aeUd_TQc\Qc\YcdteSSY_^Uc aeUXQTQT_Q_cX_] RUJc%TUCTUU\`b\^SYY_TU\] e^T_XQcdQUcdUTuQ%_b\b_WbQc_ Q`wcd_\Uc%_`_bce =\Z_?\Uc8bbd_4aeUd_T_c cec S_^c\Uz_c%^f\DSY_^\Uc%b_] \UcQ:\Q] \UrQ;\Q:\QTf\Ubd\^\$Qc i \lb_^f\U^SY_^\Uc4aeUd_T_c_c] UTY_C aeU XQ edity $QT_S_\Lambda \subset X_B$ $RbUc%U^Q_C = DTU^Q_1 Qc_M \cdot b_fYTU^SQC4ct%d_TQC_QC YVEU^SQC <math>TU$ $C : C \cdot ubde_b DTYQbY_C i U hdq_DTYQbY_C%$ XQ^dJ^T_^YW6^QdJ^TU^SQU^QRc_\ed_`QtQUhSYtQbSeQaeYUbQSd_fYbbe_c_TU\QSQRUJQ%_`QtQ`b_]_fUbSeQaeYUbS_cQ]_bQJ_UYdJReU^_i lbu5_] U^TQR\U%b\^^YWk^Qc`\U5d_' &D_baeU^_ XQi] Q^UbQTU aeU Ucd_c _ SeQaeYUb_db_] UTY_`eUTU^`b_] _fUb\QfYbbeT% Ub_ e^_ TU Ucd_c dbUc' C_RYU^%#\$D_be^Q_`UbQ\$W^Vb(\$QU^U,S_bQ) w^ DUb_d_T_c_c UVBd_c aeU c_^XU\$XQc U^_c X_] Rbuc TU UcdQ] Q^UbQ%_dbU^U^^^We^Q. f*bbet*U^U_c%_b\Qf_j`\$_^\$ebbU^dUTU.d_T_c_c\Qtj\Y*Q^_c'\C%#\$A_bQj\U^dU%Uh\$YbY\T_A_df_c`\QtQ\Q\$_]`bU^c\%^%\QtQUh\$YbQ_c $\label{eq:condition} \mbox{ReU$^{\c}} \mbox{${\tt CU$}$} \mbox{${\tt CU$}$}$ LUNQSYM^S_^\c_RZNdf_c`b`eUcd_c%QcUQ`QQUQ\Mb_LUSXQ\Q9%_bce`b_`YQSeU^dQ%AQQed_TUdUd\YQSYM^^_YYVeU^SYQT_Y'\ wfY(SQecQTQ $c_^XUSXQc\ U^\setminus c\ X_1\ RULc\ TU\ UcdQ]\ Q^ULQ\%_dU^U^_^YWe^Qf\ YdeT\ U^\setminus U_\setminus c\%_b\ Qf\ j\ S_^SelbU^UU\ U^U\ d\ T_C\ C\ C\ M\#$A_lQ]\ U^UM\%$]_df_c%_^^USUcQbQc% ^_UhSdQT_`_be^Q\eU^dUTUQed_8|_f\]\YU^d_4i `_b_dQ^d_%_bcec `b^SYY_c%_ XQ f\fateTU^U_c' C\##\$\@,\]\YddcUQTQb\Qf_\e^d\DT\Q @\\rutator T∪\Qf_\e^ntor ?_^QX\Q^`: Tg\Q\$Tc

 $f''\text{tabeT} aeUU, f''\text{SY}\%_\text{baeUU}_\text{c} \land XQSU^{-}] sc aeUTQbU/Q_`_\text{bae}'^TQTQK' \text{N}_`QbQTUdUd_YQbcuTUSeQaeYUbQ%} QcUQ`QbQRYU^{-}_`QbQ_VQT_b$ $c''`_'^UbU^{-}_\text{c} \text{d} \text{d}_{\text{l}}''\text{c} \text{TUSeQaeYUbcUcW}_\text{QSeQaeYUbQ} \text{l}_\text{l} \text{aeU}^{-}_\text{Uc} \text{bUQ}_\text{l} \text{U'dU}_\text{d}^\text{V}\text{WbQ}^\text{V}_\text{d} \text{abU}_\text{l}^\text{U}_\text{l}^\text{V}_\text{l} \text{be}'^TQT TQTQ`QbQVQT_b$ $TU_{\text{l}} Q\%S_{\text{l}}^\text{S}_\text{l} \text{TURYU}^\text{N}_\text{l}$

D_b_ dQ^d_ucqs_^cuseu^sq_R\Qc\u] \quad \text{grub\nu}\quad \text{courseursq_R\Qc\u]} \quad \text{qrub\nu}\quad \text{courseursq_R\Qc\u]} \quad \text{qrub\nu}\quad \text{courseursq_R\Qc\u]} \quad \text{qrub\nu}\quad \text{qrub

 $8_b_QbY_+'9U_aeU_cUXQ_RcUbfQT_U^UcdQcUSSW^%Q`QbUSUTU^eUf_%aeU_c`bf^SYY_ci^_SY_ucQt] Y^Q^Qc\% \\ SeQ^T_Ucds bUQdfQ] U^dUUhQ] YQT_i`UbcUWeff_U^cec S_^cUSeU^SQc_TU]_cdbQR\Uc%_SUbbQT_c%Jf^fU^dU] U^dU% \\ d_TQf^bbeT_VeUbQTU,] e^T_% aeU_cUQ^j_`_c^R\UaeU_QWe^QfUj cUbdQ,S_cQ%Jf^SeQaeYUbSQc_4_aeU_dQ,S_cQ^e^SQ \\ TURU_S_^SUR^bcU'DQbQ%_bUcd_c`bf^SYY_c%Q] Yc] Q^_SW^TUf^bbeT_U,f^SY_f]`\\SQQRcebT_i\QS_^bdQT^SSW^D_baeU \\ UcQRcebT_U^cu] Yc]_i S_^ddQY_Q,cU^df_S_] x^%_QbQce^__dbe^QSd_f^bbe_c_TU\Q] U^dU^Y^YWe^QReU^Q \\ YdU^SW^_U^CQ^fQT4i %_bcec`bf^SYY_c%LcQRcebT_ce^__dbe^QSd_f^bbe_c_S_^eQReU^QY^dU^SW^_W^CQfQT4`QbQ \\ QSdeQbTebQ^dU_e^W^%JcVQTUQSdeQbTU_e^]_df_'6cuaeU_cY^_cRQcQ]_cU^Ucd_c`bf^SYY_c%_`eUTUXQRUbe^QSd_f^bbe_c_%6_^e^RReU^TYCU_iW^QUc4i UcUf^fU^dU^_bcu] Yc]_% \\$

/cdpact.tome_c_c_t.p.i.c_cn..dxc_/ea.

 $8_b_Qb\underline{Y}'-'GY^*VWe^QTU^QcQSS\underline{Y}^*Uc]_bQUcTU^ccUUUcY^dU/WU^dUcUcds^*YWeU^*SQT_c`_bSeQaeYUbQTUY^SYYQSW^_]_df_cQ^*UUY_bUcSQU_c`_cUUUS_CQUUMUQ^UU]Q^_SeQaeYUbQTU^QcVedebQcQSS\underline{Y}^*Uc]_bQUcTU cecSbQdebQc%`Uc_b_cQUMdQvQcUWeYs4i_Ucd_Uc%eeU9Y_c^_cww_^_`eUTUS_^SUbTUQ^dU]Q^_SeQaeYUbQTU^QcVedebQcQSSY_^Uc]_bQUcTU cecSbQdebQc%`Uc_b_t\^_`eUTUXQSUb^*YWe^QS_^ZUdebQ%_`eUTUTQb^*YWe^QS_^ZUdebQ`b_RQR\UaeU^UcS_^SYUb^*U^*DQbQd_TQS_^ZUdebQU^\QcS_TUUcdQ^*QbbQUJQTURUTU^UTUbTUQWe^_c$

?_^QdKQ^: Tg QbTc @Q\YRUbaQTTU\Qf_\e^dQT

D6FHt ≯'

: ^U\ aeUU\ <FCIB9GZWUTU\ ckQi ^Ql YU^d cTUQhj YYQ^ c%U^Q` i iTUW^cQTU\ c BC8×EB: GA: B8×EB69CGTU\\RUbtDT% 6\RUTbs] kQ\% 8' MS ^dkQ\QT Sdb/^Q `eUcdQ\6F: 8CBG9: F69C'

GUSSYu^>

 $@QUcU^SQTU \Qf YbbTi \ U, fYSY 9U \Qc \ TYC \ _cYSY ^Uc \ TU, S_bQ \ u^i \ \ _c \ QSd_c \ TU \Qf _ bQTYSQU^c \ c \ SQecQ%$ DUb_ ce ^QtebQUj Q

I_^_`bb^\$^`Q,\\e^^TQ]_U^d_TU\\Qc.bQj__^Uc%eeU_c_^\\UfQT_c_Q.UcdQR\UsUb\\Qc.^_SY_^Uc`bij_Ub`\Q^_]_U^\$Y_^QT__TU\\Q \\\RUbandT%\Qf\\bateT%\Jf\SY%\S'Uce^Qce`c\\SW^%aeU\Qf\batec\TQTTU\QcTxc`c\SY^Uc QSdcTU\Qf\e^dDT%` S ^c'£dJU^\Q ^QæbQ\J QTU UcdQc T'£` c'BY ^Uc QSd c% Ub U^ce d dQ\TQT U^U, bWVJ^ SQecQTU U\ c4aeU c'\Q TYE' CYSYM^TU\Q] U^dU% QSd c TU\Qf \e^dQTY%UQ^e^SQ dQ^ReU^ %Y^U] RQbW %Y\QSQecQTU\QTYE' CYSYM^ $QSd_ \ ^cUQ \ ^eUcdbQf \ YouET\%_ \ XQI_ \ ^QTQf \ YouE_c _ \ _TYW_ \ TU \ QQRQ^j \ QU^ \ U\ VQI \ \%_ \ bU\ S_ \ ^dbQbY \ \%cY\ Qf_ \ \ \ ^eOTT\%U^ \ ce$ Y^S\YQ\$W^_Q\$d_c%UQ^e^\$QdQ^]Q, %Y^U]RQ\$W,%Q]U^_c aeU cebWUTU QW_aeU Uc_^eUcdo_fY\$Y__TUVU\$d_%_ XQ: ^QTQfYSY c SU^cebQR\U U^ U\Q 9 U QXuce WBQ^ RZJSYW^i cU XY \QTU] cdbQSYW^% Qed & beURQc%J/^S ^dbQ TU SeQaeYUbfYboeTiS]]U^TQR\U^Ucc%U\fYbYi\QSe\`QRY(YTQT%

6X bQRYU^%YUcdUQce^d cUS ^cYTUbQQcv%cU`QbUSU cUbe^Ubb b` bS]`\Ud %cv%e^QRcebT Rbed 4i aeUUc]sc

_] Q,TQT TU U_c S_^c;YcU\^_U^U_BXWU^_ SQecQ,TU UcdQc S_cQc;%cY^_U^\Q^QdebQUj Q,TU U_c'

 $\label{eq:conditional} \text{GMQLCU^SQTU/Qf 1} \text{fight} = \underbrace{S_1} \text{U^TQR/U^Ucc\% TU} \text{QTQT} = \underbrace{Se', 0\%_ \text{blc/MUU^}Q \text{QtelbQ/U} \text{QTU/Qc Tt's'}_c\text{YSY_^Uc} = \underbrace{Qsd_c \text{TU/Q}} \text{U^1Ql 1} \text{U^2dl/} \\ \text{deec.} \\ \text{U^2QT} = \underbrace{Se', 0\%_ \text{blc/MUU^}Q \text{QtelbQ/U} \text{QTU/Qc Tt's'}_c\text{YSY_^Uc} = \underbrace{Qsd_c \text{TU/Q}} \text{U^1Ql 1} \\ \text{U^2QT} = \underbrace{Se', 0\%_ \text{blc/MUU^}Q \text{QtelbQ/U} \text{QTU/Qc Tt's'}_c\text{YSY_^Uc} = \underbrace{Qsd_c \text{TU/Q}} \text{U^2QT} \\ \text{U^2QT} = \underbrace{Se', 0\%_ \text{blc/MUU^}Q \text{QtelbQ/U} \text{QTU/Qc Tt's'}_c\text{YSY_^UC} = \underbrace{Se', 0\%_ \text{blc/MUU^}Q \text{QtelbQ/U}}_{\text{QTU/Qc}} \\ \text{QTU/Qc Tt's'}_{\text{QTU}} = \underbrace{Se', 0\%_ \text{blc/MUU^}Q \text{QtelbQ/U}}_{\text{QTU/Qc}} = \underbrace{Se', 0\%_ \text{blc/MUU^}Q \text{QtelbQ/U}}_{\text{QTU/Qc}} \\ \text{QTU/Qc Tt's'}_{\text{QTU}} = \underbrace{Se', 0\%_ \text{blc/MUU^}Q \text{QtelbQ/U}}_{\text{QTU/Qc}} \\ \text{QTU/Qc Tt's'}_{\text{QTU/Qc}} = \underbrace{Se', 0\%_ \text{blc/MUU^}Q \text{QtelbQ/U}}_{\text{QTU/Qc}} \\ \text{QTU/Qc}_{\text{QTU/Qc}} = \underbrace{Se', 0\%_ \text{blc/MUU^}Q \text{QtelbQ/U}}_{\text{QTU/Qc}} \\ \text{QTU/Qc}_{\text{QTU/Qc}} \\ \text{QTU/Qc}_{\text{QTU/Qc}} = \underbrace{Se', 0\%_ \text{blc/MUU^}Q \text{QtelbQ/U}}_{\text{QTU/Qc}} \\ \text{QTU/Qc}_{\text{QTU/Qc}} \\ \text{QTU/Qc}_{\text{QTU/Qc}} = \underbrace{Se', 0\%_ \text{blc/MUU^}Q \text{QtelbQ/U}}_{\text{QTU/Qc}} \\ \text{QTU/Qc}_{\text{QTU/Qc}} \\ \text{QTU/Qc}_{\text{QTU/Qc}} = \underbrace{Se', 0\%_ \text{blc/MUU^}Q \text{QtelbQ/U}}_{\text{QTU/Qc}} \\ \text{QTU/Qc}_{\text{QTU/Qc}} \\ \text{QTU/$ TSU aeU c_^^eUcdQfYbdeT_ SeV`Q^eUcdQ?% Ub_ U^ce SQecQ%U^d_SUb U cUWeb_ aeU cU U^SeU^dQQU^^YWe^Q`QbdU U^QRc_\ed_'6cu%_b $\label{eq:local_local_local_local_local} \begin{tabular}{ll} $$ L_{\Y}^{\prime} L_{\Y}^{\prime$ ^__XQts_U^QRc_\ed_Se\`Q^eUcdtQ%Q]_U^_c aeUceBMUTUQWe^QTUdUtj_YQSYw^TUVLSde_cQTU\Q^eUcdtQ%6_] _ ce SQecQ%_QW_U^^^c_d_b_c $aeUUc \land eUcddQSe() Q4QS_ \land d \land eQSW/\%_b(Q) \land (2) Q1Q W \land (2) Q1Q$ $\begin{tabular}{ll} $$ c_d_c' BYdQI $$ _S \ed TUSe' QRYRTQT cUU^SeU^dQ^U^dQ QDeUQUI QTUUCdQ SQecQ%Y_ `_bVQSQecQTUUV_' M`_bV_dQYd_XQI aeUS_~TeSYb QSQecQXBUUV_' M`_bV_dQYd_XQI aeUS_~TeSYb QSQecQXBUUV_$ `QDQ`UD] YDDaeUXQ;`_cYRYKTQTTU\QUhYdUYSQU^SeQaeYUb\eWQbU^\Qe^YfUbcQ\TQTTU\QcS_cQc':^Ucd_c`brSYY_c%U,fYSY_%_U,]Q,]_LQ,^_ `eUTU Uh'x'dbU^SeQaeYLbS_cQaeUUc e^UVLSd_4`_baeU \QSe\`Q^_S_^c'x'ddUU^\Q^QdebQUJ QTU\\Qc S_cQc%x'Y_U^ce SQecQ4QcuS_]_`_`_bBY

*+)

\\Qe\d^Ucc`\Qc_Q`\Qc_\%TU:TU\e^\QTU\\Qc\SQecQc] sc\RQQQ\e^\Q] sc\QdD\%QcdQU\YY\^\d_4i aeUUcQ\Y_^T_`\QqU\dd6\Qb_TU\] e^T_% `QdQ

`Udj YdbaeUXQi`_cYRY(YTQTTU/QUhYdU^SQU^SeQaeYLb/eWQbU^\Qe^YfUbcQYTQTTU/QcS_cQc': ^Ucd_c`bYSYY_c%U,fYSY_%_U,f]_Q,f]_bQ,^_`eUTUUhYddbU^SeQaeYUb:

@(\Rubat)T TU \Qf_\e^αt)T = ?_^Qδ(Q^*: Tg Qδ(Tc

UKBd_c c_^~USUCQBC%YVT_YUFYQRUJ U~US_~USQT_S_^ce SQecQ8`_b_ dQ~d_%Qx~%QSQecQUc U, Se\`QRU M_ aeU cUTUTeSU%aeU

VQe\drucc `eUTUUcdQbcw_ U^UcQ SQecQ%aeUUc cw_ e^Q SQecQ% ~\fwk^UKBd_TU^QTQ BYdQ] `_S_ `eUTUUcdQbU^Ucd_4`QQU^d_~SUc dU'U

aeU UcdQbU^\Q^qebQUj QTU\QS_cQ] Y_J Q4^_ U^ce cubTU SeQaeYUbTududj YQSw^TU\Q^eUcddQ%Y^QTQTUVUSde_c_U^^c_d_c_de_c%aeUUc \Q

SQecQ%YdQ] `_S_ `_bSeQaeYUbSQecQU^QRc_\ed_4`Qd0%_b\Qce`_cYSw^%_ Uc ^\fwk^UKBd_% ^_dU'U SQecQ M`_b_ dQ~d_U, aeUfQQ

] Q7dU^UbaeU^_ Uc \Q^qbbQUj QTU_c XsRYd_c_Q6d_cTUf_\e^qdT aeU XQSU aeU cUQ^fYbbe_c_c_TUVUSde_c_% Ub_\QSQecQ%TURUUZUSedQb

Y_J UTQQJ U^dU Qcu_J Y_J TUce `b `\QQdd_QSw^4i %U^U, U_J Q^dU^J YU^d aeU%CU^cYRUJ U^dU%CUS ^ddqTSU^i ^\maximuq^*

cd UcSNUbd.%aeUcY\cUNUSdcc^fYSYcciTUNUSdecQ%^TUce^QdebQUjQ% TUSeQaeNUbScQaeU\UcUcYXUbU^dU%Y^ `baeUc ^TUe^Q]QQSQecQ%dUrUaeUcUbQSQecQTU\Q]QTQTTU\QSQecQ3e^]Q\UVUSd U^\Qf \e^dQTTURUcUb]Q,% `_baeU\QSQecQUc]Q_%_TUe^Q^QdebQUjQ]Q\WYQ%_dW^U]QTQTS_]_e^QSeQ\TQTYYUdU^dUQU\Q% e^ReU^U\USd_U^\Q f \e^dQTTURUcUbReU^ %U^bQj w^TU\QR ^TQTTU\QSQecQ% cecYU^T TU e^ReU^d' i ^qdebQUj Q McYUcd Uc\ aeUcU $aeYUUUTUSYSUN ce`eUcd_TUSe\`Qi_VQQQRQ^j_Q^-`eUcd_U^VQ^QdeUQU_QSCQSUU_QSQecQSUUS_^dUS_^dUTUSe\`\Q_NQQQRQ^j_Q^-`eUcd_U^VQ^QdeUQU_QSQecQSUUS_^dUS_^dUTUSE\`\Q_NQQQRQ^j_Q^-`eUcd_U^NQ^QdeUQU_QSQecQSUUS_^dUS_^dUS_NQSQECQSUUS_^dUS_NQSQECQSUUS_^dUS_NQSQECQSUUS_^dUS_NQSQECQSUUS$ \] U^ c bUc \fUb\Q ucu^SQTU\QfYbdeTi U\fYSY U^\Q^QdebQUjQTU\QcS cQc% ce` ^UaeU bWY^Qj U^dUS ^cYcdUU^dKQd&M cYe^SQFYUbdtU^U e^Q] U^dU QS_tbUbTUcTU U\ QRcebT_%Q\ TUSYB B_%QSe\`QTU\QS_cQ%aeU Uc\QSQecQ%_bQTYSQ U^ucd %aeU \QSQecQcuUcTUe^Q^QdebQUjQ]QQ%UbaeU\QSQecQUcU,]Q,U^UcUcU^dT %aeUUcTU dbQ]QQSQecQ %&cYU^T U, QRcebT__cUMeYts4_baeUcYUcQcuMJ/d_^SUc\QSQecQQ^dUcTUSQbMQT_cUQRc_\f\WQ\QfUj%d_TQ\QSe\`QTURUcUb`eUcdQQ \QSQecQce`UbYb% TURUS_^c\cdbU^aeUUcdsc\tu^T_]Q_c%_TUe^Q_^QbbQUjQ]Q\twq6cuaeUQX_bQXU]_c\\UMQT_TU ^eUf_QUSXQb/QSe(`QTU_SU^cebQR(U%Q)Q_^QbbQUfQTU\QS_cQ%_^QQbSQecQ_McYQW6^_UcdQ^d^d_S_]__`QbQ\b]_sc Qd_d_TQ*uQ% QcSU^TUb`Qc_Q`Qc_%QcdQaeUcU\\UW&UQUc_aeUUc\Q`bij UbQSQecQTUaeUcUdbduU^d_T_U\Qce^d_% fQQ TUSY8/d_TQ\QSe\`Q\bQTrSQU^aeU4U^d_^SUc%_b\Yr%dU^UaeUcUb_R\\MQT_Q`_cUUb%aeU\Q\]`\Ub\USS\w^TU_aeUce`_^Uc__ ^_dtU^U_bWY^Q%UTUdUdj_Y^Q`_b^YV\x^Q\$d_TU\Q^eUcdtQ%Lc\$QecQTQ`_b^QTQTU\U\$de_c_U^^_c_dc_e%\U^T_ ^_SY_^Uc ^QuebQUc TU\QXe] Q^YTQT%aeUU\]Q\]_bQ%_^ce TUcYUbd_TUQfUbcYw^i bU`eWYQ^SYQ% d_T_ccec_db_c]Q_c] \tukusnj \tu^d_c%_^c\tu\u^e^Q\s\u\a\tu\u_ij \rqt u^\Q ^Q\ebQ\uj QTU\s\u\a\ta\tu\`_c\s\u^\c\tu\\s_bQ\w^i _c \Q\eq d_c\tu\Q f_\e^dQT4i ^_ U^\QTUV_b] YTQT TU_dbQS_cQ%TWUbU^dU TU\QS_cQ] Yc] Q4aeU] UbUSU bU`eTY_%cU ce`_^UaeU\QSQecQTU U_4& _aeUcUbuQQRcebT_%_baeUUc_cUbuQce`_^Ube^QS_cQaeUUc Y_SU^dUi ^_U\]Q%U^fUbTQTUc]QQiTUWSYU^dU%_baeU _dbQS_cQUcU\]Q\':cd_Y}`\\6Qe^QS_^dbQT\6SYM^4`_baeUcUbuQce`_^Ub%_]scUcU^SYQ\aeUUc]_bQ}U^du]Q_i S_^TU^QR\U%\Uc _SU^dU i ^_ SU^cetQR\U4`Ub_ aeU_dtQS_cQ%aeU Uc ce SQecQ%cw_ Uc U\ Se\`QR\U 9 US16%aeU U\ f18Y_^ `b TeSU

@\\RubattrTU\Qf_\e^attr

] QTQT TU UcdU x/dI _ ^_ cU U^SeU^dbQ U^ U, `biJ Ub_% Ub_ Uc T'cd^ α QTU U/Q4i \Q] QTQT TU QI R_c bQT'SQ U^ \Q ^QxbbQUJ Q TU,] Q, TU\Q: S_cQ: aeU c_^] Q, c'

@ aeUXQSUaeUU,`USQT_TU_TY_%Lc QaeU,`_bU,aeU] UtUSU\Q`U^Q4aeU^_Uc cY__\QUh`tUcYw^TU_TY_M_aeUXQSUaeU \QfYtateT`tUSYcQXUc\Q]Y:]QaeUU^\QSeU^qDTU\QaeUUcQ`d`QtQHUSRYbQQRQ^jQitUS]`U^cQ4aeU^ c^cYc\Qc Uh`bbcy^ucTUUcdf_QiQi DiDub \ aeUXQSUaeUU\f*SY TYc %bcce^QdebQbujQ TYcQ4iaeUaeUXQSUf*bdeT`bbSycQ%bc ce ^QxbbQUjQQ] WQRUU: ce^QSVbdQRUUiQ TUV bj YTQT aeU c ^YXUbU^duc QucURYU^] Q,f /e^qQT%aeU uc u, Qj QTU/Q fYboleTiU\fYSY#^U^\Q SQcYw^TU\Q]Yc]Q\$%aeUUcce]tbbdTUUcdd[Q TUcUcdl[Q%QQRQ^jQ]U^c`bUSY%TUQSeUbT $Q_{x} = T_{x} T_{y} Q_{x} = T_{y} Q_{x} Q_{x}$] Yc] %J^fYbbeTTUe^QS ^cYTUbQSW^TYcd^qQB Uc]tbdTU]U^ c`bUSY TU\Q^QbebQ\UjQTUe^Qf\YSW^]Q% ^ U^ce d dQ\TQT%\re^QSd Q^dUbY b%aeU Uc ce SQecQ4TU\ S ^dbQbY \Qf \\S\w^] Q\%aeU Uc U\ UWUSd %KQ] Q,] bQ\%] sc aeU\Q U^VUb] UTQT% Q,Wk^ db TUcQcdtU ^QdebQ,%aeU cebWUTU e^Q SQecQ] bQ] U^dU] Q\ 6cu% bUZU] \\ %Q Y^WQdXbeT Uc TU TY i TWY TU] U^ c`buSY %TU QSeUbT S ^U\ cu^dt S] x^4B ` baeU QW dQ^] Q\ `U baeU\QYWbQdbeT%eU\QSQecQaeU\ `b_TeZ_4cY__`_baeUUc_TY_c_U^cu]_Y:]__%TUV_b]_YTQT_YXUbU^dU_D_b_dQ^d_%U,Q]__bTU\QfYbobT_UcQ]_QR\Ui_TYW__TU U, WY% cw, `baeU\eUQW]scQ^dLcTUaeUUcdUQ|bQ\QfYtoteTU^^eUcdbQ]U^dU%, aeU`bfSwaeUdtU^U^\eWQbQ\\u4& `_bUZJ]`_%eUcobQ`b_`YQU\USSW^4U\UM]_cQ]Qb\QfYboleTi%_bQ\Wx^]td_T__TU_ob_dY_%QRbQT_Q^c_ob_c]Yc]_cU^ U, QI DTU U/(Q4&) Ub TURYT Q/(QQ) YQR/U^Ucc i S ^TUcSU^TU^Si TU e^QTYE` CYSW^ i /QYS/YQSW^TU/S bQ w^dQuc' GYUCU \vebUbQU\SQc %aeU^^ c UUWbQ\Q] bTUfYbbeT% Qcu`bTeSUaeUU\Q] bU^^ c db c]\Y] c%UcQUUSS\w^U^cu]\Y]Q^ `TuQcUbTU dbQ]Q^UbQQ]YWQR(U TWW TUQQRQY;Q%aeUS]U\Q]bQ\QfYddeT%QWe^Q dbQYS\YQSW^QvQRU%U LIZUSSWi aeU'jj`\'SQUc'GYUCQU(USSW^VeUQjQR\UU^dT%SUU^UaeUcUbQcuTURYTQQWe^QSeQ\YTQTQjQR\UU^\Q ^QdebQUiQTU\QUUSSW^GYU\UWI cQIQb\QfYbobT% U^U,QI bQ\QfYbobT% SeQaeYUbS cQaeUUcdDRQRYU^icUUZDBU ^YWk^di'_TUReU^QT\c`_c\SYk^`QQUUSSYk^%QU\USSYk^U^cu^_UbQf\Ybde_c_%YT\W_TUSeQae\UbU_W[%TUQSeUbT_S_^ U\cu^dt S] x^% QaeU\QUUSSW^^ UbQTUReU^Q^qabbQUjQ DeUTUaeU^ cUQYQTUSeQTQ`QbQd] Qb^ dQTUQW TYSX `be^Qedb%aeUXQXUSX x\dfQ]U^dUe^\eUddUbeYFU^6]tb\$Q!I^QcQ^dfQT^USUcQbQ#f\$Ut\\$XQ;cQ^dfQT'6TQ]^ `eT_cUbSbUQT__bWM^Q]U^dUU^\QZecdSYQicQ^dTQTTU\QfUbTQT%_baeUdW^UaeU_`dQb`_bcUbZecd_%Q^dUcTUaeU`eTYUbQ cUbZecd'M`b\dQ^d TURUUhYcdb%dU^U aeU cUbSbUQT 4cu%t\TURU UZDbUbU,`U^cQ] Yu^d i \Q'bUXUhYw^%Q^dUc TU aeU t\UbQ Zecd';=Q[]eSX_]scU^U,]tc]_cU^df_U^UcU\eWQb% dQ]Rtt^U^``-,0%,1%,2%-)'GYUcdQcS cQcc^Qcu%cY^TeTQ fQQcUWeYo%aeU\Q`bij UtQU\USSW^`QtQcUbZcd_cXQi U\USSW^Zcd_4^_XQi ZecdSYQ_cQ^dfTQTU^U\Q\%beU^YWe^Q UNSSW^`QbQcubZecdcfQTUQ^dUTUt\'DQbQaeUXQR\QS\QbQ|U^dUTU\\QU\USSW^TUcubZecd%6] \ aeUTURUc]UdutuQ \QZecd\$Q4i\QaeUcYMeU\QUUSSYM%\YT_U\UVUSd_TU\QUUSSW%_`eUTUXQRUbZecd\$Q_cQ^dfQT4`QtQe^UVUSd_Uce^Q ^^ eutiu seqaeYubs cqaeU uc s ^cuseu^siqtu ucquiussiw^% ui, uvusd tiu iq] ic] qi%ubs zecdsiq cq^dtqt4^^ eutiu SeQaeYUbS cQaeUUc cY U,USSYw %cUts ZecdSYQ cQ^dTQT'

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9U] Q^UtQaeU`_bUcdUUcaeU] Q%d_TQ\Q \mathbb{Z} cdSQi \QcQ^dTQT UcQ\QfUj UhS\eYT_cTU\] e^T_% ^_XQi `eUtdQQRYUtdQ`_b\QaeUcU`eUTU cYU] `\b' \mathbb{C}^{N}

Ge`_^W_ aeU\QV_tij QU^aeU_c X_] Rtttc \\UWQb_^QU^dttUUDQUcdQ^_S\W^QRcetiTQYS_^XtdU^dU\%_^httc \\uddots \\underset \\und

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BYSY`YcTU`b_QQ] U^SY_^QTQc buQdY`Qc Q\QQWU^SQ] _bQ%QfYbbT%u\fYSY`% 5% c ce ^_SYo^] UdQwcYSQTU\QQWU^SQi \QQSSYo^

9YSU^aeU%Q] U^_c aeU u\Q] QdU^U e^`_TUbTU Qed_TUdUd\YQSW^%_dU^U`_TUbTU QSSW^4cYcec f_\SY_^Uc ^_cUbSQecQT_c|_bcu

] Yc] _% Ub_ CU UhSYQ^i TUdUd\YQTQc _bQ\We^QSQecQUhdbu^cUSQ%aeU ^_`eUTU^cUb`b_`Y_c QSd_c TU\Q] Q4i aeU u\Q] Q^_`eUTU

cUbQSdY_% Ub_ TURU cUbd_dQ] U^dU`QcYCQAU^QaeU_c U\USd_c aeU Uc u\dJ\QTU ^USUcQSQ\U U^dU% ^_TUce`b_`Y_\NRU

TUdUd\YQSW^

 $\texttt{EeUU}_{c} \texttt{NM}^{\text{MSQT}}_{TU}(Q^{\text{CQRbQTU}} QSSW^{96}_{-}] = \texttt{U}_{1} \texttt{GB} \\ \texttt{8 XeRr}_{i} \\] \\ \texttt{eSX}_{c} \\ \underline{\texttt{db}}_{c} \\ \texttt{Leg}_{W} \\ \texttt{Q}^{\text{NbL}}_{2} \\ \underline{\texttt{d}}_{Q} \\ \texttt{U}^{\text{MV}} \\ \texttt{YS}_{-}] \\ \text{Leg}^{\text{NbC}}_{W} \\ \texttt{U}^{\text{NbC}}_{W} \\ \texttt{U}^{\text{NbC}}_{W}$] Q^MXUCd % baeU`UbdU^USUQce ^ SW^TUe^QQSSW/%aeUUcQW U^aeU^ XQi `QcYw^ \Q`QcYYTQT4UcTUSY%#TUQ\$eUbT S ^ce cU^bTT TU $\label{eq:continuous} $$ Q^\circ_Q^* = U_0 + U_0 +$ ^VXK^UKUSd_4`QQCUbe^UKUSd_Y]`\YSQ`QCYYYTQT%_U,CUbceZUd_Q;`_TUbi \QQSSYM^TU\ce SQecQ McY^U] RQXY_%_CdV^UY@eU\QQSSYM^TU\Q] Undulus U, UNSSI_TUce `b_`XITUSU] YQSW14CV%QTUSUD] YQSW1/YBU I f_\e^dQbQTU\Q] Undv α eU Us_] \text{\text{\$\exiting{\$\text{\$\ $aeU/QQSSW^UcU,UVUSd_TUQW_QYdUY_UW^Sec_e^QSd_`UUSUTU^dUTUUUSSW^3i_`b/_dQYd_%U^UcdUcU^dT_%Q]_UYdUUc_`QcYQ%eZUd_Q/Q$ `_dJ^SQi \QQ\$SYw^TU\Q\$QecQQ^dJbY_l%neUUc\Q_`\$%^Q^dJbY_l%\`_b_dQ^d_^_`eUTUcUbQ\$df'_'6cuaeUQaeudJ^U]_cUcdQ\$_^ddTN\$SYw^% $aeU \setminus Q C S S W \land Uc \ C Y I] \ \ `ku \ U_i \ UV S G \ TU \setminus Q U U S S W \land Q \land Ub Y B M \ \ `_b \setminus \ dQ \land \underline{d} \ \ \underline{\wedge} \ \ `eU TU \ X Q R U b Q S S W \land 4 `_b aeU \ Uc \ `Q Y Q Q \setminus Q \ `_dU \land S Q TU \ U C Q U U S S W \land 2 \ \ \underline{h} \ \ \underline{h$ UhS/ei U d_TQ ^USUcYTQT' M%_b_ dQ^d_%ce ^_SM^TU Q\$S'M^\j\ `\\\$Q%aeU ^_dX\^U ^\\\&\QTU` U^TU^\$\Q_ S_^Uh\\^\\$_^\$=QaeYUbS_cQaeU_ QSSM^\f\ `\KQ\Q^USUc\f\Qf\% ce`_^UaeUUt_^USUcQ\f\% ^_`eUTUt\\S_^d\f\WI^dU D_baeUU_c cU\f\ QM^Q^%aeUd_T__aeUcU\\Qf QTUSEQTQ| U^dU/QQSSW/%TURU.cUbTUdUb| Y'QTQ`_b/Qf_/e^dQTi/Q/\R&U.U\USSW/4i Ucd_ Uc.dQ^d_S_] _ TUSY%eeU.cUTURU.aeU.cUQ^USUcQb/_% CWT_TV_U^TW^U% TUBUG_YQT_`_B%Q,W_Q^UUY_B%LC TUBUS%^QSd_Q^UUY_BTU U,USSW^ I ^QFU]] sc% UbU^USU Q\Q^_SW^TU QSSW^%TU_ $aeUUc\ e^QS\underline{d}\ b_Y i\ U_I\ Ub_\%aeUUc\ U_Y bYSYY\ TU_I\]_fY_Y UY_\underline{d}\ TU_UUZUSSYY\%$ aeU^ Lc U,S] U) Q^T TU] fY] YU^d Lc\eUtj TU` dU^SQ% Lb Lc S ^cL5eU^dUi TU`U^TUTU e^\Lc\eUtj Q^dLbY bTU` dU^SQ%QcQRUb U, `_TUbTU\Qf_\e^dQT`i U\USSYM^4`_baeUTYSU^aeU__XQ; QSSYM^QTUSeQTQ`Ub__ aeUcUU\WWU\RbU] U^dU%__ aeUuc_] Y;]_%TUbUj Y^QT_`_b $e^Qd_Q^dUb_L^bTU/RbUUUSSW^DDb_cYQWe^TUUU_cTURUbs~i~aeU~^\bullet eUTUS_d^dWD^dU~D_baeU~UU_c~c~U1)~QW^Q^aeU~d_T~\ aeU~c~U1Q)~Q$ $\textit{QTUSeQTQ} \ \, \textit{U^1U} \ \, \textit{QQSSW^3TURU} \ \, \textit{CUbTURU} \ \, \textit{YQTQ} \ \, \text{_b/Qf_/e^1QT} \ \, \textit{IQ/RbU} \ \, \textit{UUSSW^3I} \ \, \textit{Ucd_Uc} \ \, \textit{QQ^1_S} \ \, \text{_TUSY/eeU} \ \, \textit{CUTURU} \ \, \textit{aeU} \ \, \textit{CUQ^1USUCQb_2/} \ \, \text{_TUSY/eeU} \ \, \textit{CUTURU} \ \, \textit{AeU} \ \, \text{_UC} \ \, \text{_U$ CWT_TU_U^TW^U% TUDUG YQT_`_b%QW_Q^UUY_b%Lc TUSB%e^QSd_Q^UUY_bTU U/USSW^ I ^QFU]] sc% UbdU^UU Q/Q^_SW^TU QSSW^%TU_ $aeUUc\ e^Q\&d\ `b_`Y_i\ U_i\ Ub_\%aeUUc\ U_i`bf^SfY_TU_i\]_f^iJ_1Uf^d_TU_iUZUfSfY_TU_i`_TUU\%Ub_Qx^cUTQQU^dU^TUbU^ce\ ^_Sfw^TU_QSSfw^%$ $aeU ^_ Uc \ U_i S_1 \ U_j \ Q^T _TU] _fij \ U^d _ Uc \&U_i _TU ^_dJ^SQ\% \ U_2 \ Uc S_^cUSeU^dUi \ TU \ U^TU TU e^` Uc \&U_i _ Q^dUb_b TU ^_dJ^SQ\%Q cQRUb \ U_i \ Uc S_^cUSeU^dUi \ TU \ U^TU TU e^` Uc \&U_i _Q^dUb_b TU ^_dJ^SQ\%Q cQRUb \ U_i \ Uc S_^cUSeU^dUi \ TU \ U^TU U U e^` Uc &U_i _Q^dUb_b TU ^_dJ^SQ\%Q cQRUb \ U_i \ Uc S_^cUSeU^dUi \ TU \ U^TU U U e^` Uc &U_i _Q^dUb_b TU ^_dJ^SQ\%Q cQRUb \ U_i \ Uc S_^cUSeU^dUi \ Uc S_^cU$ `_TUbTU\Qf_\e^dOT; U\USSYM^4`_baeUTYSU^aeU__XQ; QSSYM^QTUSeQTQ`Ub__ aeUcUU\WWU\RbU] U^dU%__ aeUuc_] Yc]_%TUbU} \YQT_`_b $e^QSd_Q^dUb'_LbTU/YBUUULSSYM^DUb_cYQWe^TUUU_cTURUbs~i~aeU~_`eUTUS_M^dWU^dU~D_baeU~U/_c~c~UY_QWA^Q^%aeU~d_T_/_aeU~c~U/QQ~QTUSeQTQI~U~dU/QQSS$ @\\RUMDTTTU\Qf_\e^dDTC ?_^QX\Q^^: Tg\Q\$TC

ENTRY CARRANGER IN LANGER PLANSKRIN LETT-CARROL IN CRAW SET IN CREAKED CORROLL AND THE LEAD IN CREEK CARROLL OF CREAKED IN LATING AND THE LEAD IN CREEK CARROLL OF CREEK CARROLL

9U] Q'UbQaeUe^Qsd_%TUQseUbT_S_^ce_^S\r^] \ubQ\ubQxbQTU\Q] \text{?} \Q\ubQ\ubque \Q\upq \\ \text{VW}_\text{Q}\text{TUQ}_\text{L}] \sc aeUe^Q \\ \text{S_\text{C}}\rangle \text{TU}\Q] \Urd\ubqab\ubqae\ubqae\upq \\ \text{Q}\text{VW}_\text{Q}\text{TU}\upq \\ \text{Q}

@\\Rubattr TU\Qf_\e^attr

8_] _ $\Q \SW^ \Big]$ Using the formula of the condition of the condition

 $TU \setminus Qf = \text{4U$} - TU \setminus Qf = \text{4U$}$ f_\e^dQbQ]U^dU%_S_]_U\U\USd_TUceU\USS\W^Q\S_^d^eQS\W^\J\^U\cU^dT_]sc`b_`Y_%\S_]_\Q`Q\QRbQUc]sc_b\W^Q\iTUec_S_]x^%U $TSU a e U QSd Q Y ^1 Ub_c Y U C Q U U SSW ^_ `_b f_e ^ A Q T T U C U D Q e d_S T U L U P Q ^_4 C Y C U ` e U T U S_C U S C D S_^ _ Q Y L UY_U S MA C U C W_X X Q Y M E Q A I Q C U Q C U P Q A C Y C U ` e U T U S _ U S C D S _ ^ _ Q Y L UY_U S MA C U C W_X X Q Y M E Q A I Q C U Q C U P Q A C Y C$ $\label{eq:continuity} $$U_0U_0^T = S_0^T = S_0^T - S$ $\texttt{cU-ediff} \ Q \ \texttt{CPN} \ \texttt{idQ} \$ `eUTU cUbbQj_^QR\UJ U^dU\e^^TQTQU^^dQ, ec_ TU UcdU dHJ Y_% QbQ`b_RQbSeQaeYbbS_cQ% Ub_ce`b_`Y_`\QSUb DQbQ_cdUw_Wci \Wwc_Vc Unt BWSQ| Undu `QbQYcdQbQdQUc QbWe| Undic%5_] _ cYVeUbQ^ce\WSYUndu `QbQQ`_i Qbi TU| _cddQbd_T_ e^\UcaeUj QTU\Q\W[c_\WQ] _bQ,i \Q XQ^S_^fUbdT_U^^QbbQ,`QbQS_^d^eQ5W^%edN;'Qb\Q`QQRbQU^bcdUcdUcU^dT_%#YUcaeU`eUTU\\Q]QbcUe^cU^dT__cWM%QT_%_aeUUc $$$ Y^{S}_1 \circ Q^{R}US_1UQ_1 \circ Q^{S}CYU_1 RQ^{S}U_2 \circ TU_1 = UcdQQaeUUcQWQTQRUQQC_2 \circ Y_Uc_QG^{E}QUc_c \times_1 RUcdUU^TU_QcS_cQc\% aeU$ ^_`eUTU^cUbSeQaeYUbS_cQU^\QSUUQSW^aeUTURU!UU`_^TUbdQ;c\WY\MSQT_'M@e^aeU'Q`UQ^Q\QU`UbU^SYQ%LYUJ RQW_%QfUbTQT'Uc aeU _c X_] Rbuc Ucds^d?\UZcTUUh`UbIj U^dQbSeQaeYubS_cQ`QbuSYTQ%cY_aeUUc'lj`_cYR\U`QbQU_c dU^ubSeQaeYubS_^SU`SYw^TU\Q] Yc] Q fUj%_b\QS_cae} RbU%cUXQ^S_^fUbdiT_U^^QbebQ,`QbQQS_^d/^eQSYv%edKy`Qb\Q`QQRbQU^UcdUcU^diT_%#EYUcaeU`eUTU\\Q]QbcUe^ccU^diT__ $\text{c*WYMSQT}_{A} \text{ aeUUc YS}_{1} \text{ Q$EQUC } \text{ Q$e$ $TU \c S_c \c S$

GYXQi aeU_RZbdQ%aeU_QQSS%^i \Q`Qc\w^c_^`QQRbQcYTeTQR\UcTUe^Qc\W^MSQS\w^S_^bdQbQbDub_ce`_^UbaeUU\ QWU^dU%J^ce QSS\w^%Jcds RQZ_U\`_TUbi \QYY\eU^SQTUQW_Ydbu^cUS_%Jc`QtQS_^\e^*T\bQ\QQSS\w^i \Q`Qc\w^% XQSUb aeU\Q]Y_I QS_cQ8 @\\ruadot \tau\qf_\e^d\tau \\ ?_^Q\ruadot \\ ?__^Q\ruadot \\ ?__

FUC` ^T %aeU\QQ\$SW^i\Q`Qc\W^c ^%\YTETQ%QaeUcUed\YQQQfUSUc%Qc`QQRbQcTUc\WYW\$Q\$W^ `eUcdQ4`Ub ^ S] $\label{eq:continuity} \textbf{CMV-WSQT}_\textbf{Uh'tdU^SQt}_\textbf{eUcd}\texttt{c}\% \textbf{Ub}_\textbf{cw}_\textbf{QC} \textbf{BUQSY}_\textbf{Uc}_\textbf{eUcdC'} \texttt{QQC} \textbf{QQC} \textbf{QQC} \textbf{QQC} \textbf{QUUSQC} \textbf{c}_\textbf{d} \textbf{b}_\textbf{Y}_\textbf{c} \textbf{TU}\textbf{QCWV-WSQSW}.$ `euted 4`ub %Y^u] RQbW %YQWg aeu%]Yd] `eutu%Q,]Yd] `dU]` %U^TWUbU^duc Qc`uSd cibuQSY ^uc%ubQ\Qfu|SQecQ i UNUSd.%ucd_^_fQQbuce\nQbaeU.S_^\e^ThbQ_cdtbj\Y_c':\Qj\Q`eUTU.cUb.dQ^d_QSdfQi`\QxYQU^\Qj\Y;\Qj\Y_Q\^T%UbU^duc Qc`U5d c4Q5dfQS $^{\text{L}}$ UQ5W $^{\text{Q}}$ Q $^{\text{C}}$ US $^{\text{L}}$ UQ5W $^{\text{Q}}$ Q $^{\text{L}}$ USU U $^{\text{L}}$ USU U $^{\text{L}}$ CYV $^{\text{L}}$ USU U $^{\text{L}}$ USU U $^{\text{L}}$ CYV $^{\text{L}}$ USU U $^{\text{$] 'k] _ S_^\Q` \cr\nTQT% e^cUb`\Cr_% e^cUb\QSSY_^QT_ `_bQ\W' @ SeQ\Uc e^Q] UbQ\b\QS\w^TU e^Q\S_cQ\Qe^Q`_dU^SQ_ \eutigQUZLGSTQ`bQ,\ve^QSQecQ%bTeSbQ,\ve^U\usedU^tyU\usedU^t\U^\u\\Q M\QQSS\w^%6eQ^TUcdsSbUSdQ]U^dUQEcdQTQU^`cYSw^ QW U^ $dQS cQ%'U^T QUQSW^ \end{cases} e^QUQQQ ddQ%QcQRUb e^QUUQSW^TU `TUb% \end{cases} eUd <math>Q\%UQSW^TU^T QSQcQXQSQ ddQ$ S cQ%aeUUcU,dU]QTU,UVUSd TUaeU\QU^UUMMQ9UXUSX %Q`QQRUQQSSW^cUedKYQS ^V&USeU^SYQ`QQXW*MSQbQW^] UKQI UMU KUQAT_% Ub_] sc QRc_\edQ% e^QUn'xdU^SQ KUQAS_] _ SeQM_ TUSYI _c e^QQSSW4SeQM_ ^c cu edXY Q\Q` QQRkQ $dQ \sim W^{2} \ U_{Q} \ Q \sim Q U \ Q \sim W^{2} \ U^{2} \ U^{2} \ Q \sim W^{2} \ Q \sim$ RZUJ UVUSOJ % dQ_S] cUednjiQ`b\ dQ^d %° Uc`b`nQ]UndU\ S nddQb/TU\Q`QcNv%aeU bTnQbQ]UndU^ cNVnWbQ nQTQ QRC \edQ%(^^ aeU c)j `\Uj U^dU\QbUQSW^TU cUbUZUSedQT c' M` b\ dQ^d %(^\Q \QQRbQQSSW^cUQxd(U^\U,cU^df bUQdf %5] % QS $^{\circ}$ QSSW^i $^{\circ}$ QCSSW^i $^{\circ}$ QCSW^c $^{\circ}$ CW, T c $^{\circ}$ CW, T c `eUTU^`UadI^USUbQ\Q]Y:]QS_cQ%Q\]Y:]_aXU]`_%S_^bUc`USd_QT%UBU^dUcS_cQc'D_b_aQ^d_%e`_^UbaeUXQ;QSd_cTU,Q]Q `_bu\SeQ\e^X_]Rbu\cu]eUfuTuVbjQf_\e^qqbQ%iQSakQc_Rbu\c_Rbu\c_Rbudc%i`b_TeSUUMDSdcaeUQx^U_c]`b`]_cc_^\c UNUScic TU QWE^Q dbQS cQ% U^U, aeU U, Q] Q] Y; QUc RZUd TU QW aeU QSckQc RbU% aeU Y`Nei U^aeU % U^QRc \ed S ~\&^T\bQ\$S\w^i `Qc\w^ c\^U] RQ\$W \%Qc `QQRbQc `eUTU^cUbQTU\$eQTQ] U^dUTU c\\W\\\\SQ\$\w^ `eUtu\g\i fWTQTWQTYKUW^SXQU^dWQSdeQbi TUcWbSQecQT_cQQSdeQb%Qe^aeUTURU]_cce`_^WbaeUU,Q]Q\ckQ]Yc]QdYd_U^\Qf_\YSYW% i QaeUXQi U^ddUfYfYbi cUbQSU/UbQT_%_XUSX_`QxQfYfYb B_ Uc] sc e^QS_^dbQTYSSW^% QxQce`_^UbaeU\QQSSW^`eUTUcUbU\ UNUSCITU QWE^Q_dQQSQccQ%QTU] sc TU, QWU^dU_cYU^T_aeU\ c QSd c%aeU ce`_^Us%aeU\QfYTQ`eUTU cUbU, UNUSCI TU QWE^Q_dQQ SQecQ%QTU] sc TU\ XWQT_%_U\ cUbaeU fYTQc%J^_c aeU \QfYTQUc_R\YWQT_QcUb

@ $aeUXQ||UfQT_Q|_c X_]$ RBULU \\ \Company \rangle \r

DUb_ Uc] ei Uf YTU^dU%aeU U^\QTYcdYSYW^] UdQxcYSQ U^ddU \QQSSYW^i \Q`Qc\W^%#Qe^aeU XQSU dUJ `_ aeU cU S_Yf YdddU^U^S_] \times i \Q] _TQU^\WU^UDQ\%TURYT_ SeYTQT_ ^_ cU XQ\\Uf QT_ QS_^V_i J QbU\\U^\WeQZU TU \Q^QdebQ\U QTU \Qc S_cQc\%_` QdQ SeQaeYUbYTUQc TYcdYdQc i S\QQc 4&S_] __ Uc U^_db_c di bj Y_c \Y_c\WS_c\}_ UdQxc\S_c Y^e] UdQx\Uc\%aeU cU edi\y Q U^\Ucd\c TYc` ed\c4aeU XQ _SQc\f \70T_ YUh` \Luc\QR\UT\WS_\dT\S_\N^\US\\S_\S_\N^\US\\S_\N^\S_\N^\US\\S_\N^\S_\N^\US\\S_\N^\US\\S_\N^\US\\S_\N^\US\\S_\N^\US\\S_\N^\US\\S_\N^\US\\S_\N^\US\\S_\N^\US\\S_\N^\US\\S_\N^\US\\S_\N^\US\\S_\N^\US\\S_\N^\US\\S_\N^\US\\S_\N^\S_\N^\US\\S_\N^\S_\N^\US\\S_\N^\US\\S_\N^\US\\S_\N^\US\\S_\N^\US\\S_\N^\US\\S_\N^

GUSSYi^≫

@C: LC[_^U: `_b\C: aeUQWe^_c `YL/cQ^aeUQ; S_^dbQbY_TUcU^dbT_S_] v^% CbQce`_^UbQaeU\\C: S_cC: aeUc_^^U5UcQbQc:%

DCbQcUbTYW__TUSeQaeYLbQCRQ'j Q_\QSe\`Q

>9 UXUSX_%LC e^TYSQTT_] ei c/j `\UTU\cU^dYT_S_] x~%aeU\Q~USUcYTQT ^Qaebq\uc_d_dQj U^dU^YS_] `QdR\US_^cw_QQRQ^jQ_\QSe\`Q'
GY_c X_] RBUC XQSU^S_cQc aeUU^cu] '\c'] Qc c_^] ei ReU^_c%u^S_^TYSY_^Uc TU cUbdbQdT_Q `QcQb% UXUSd_c] ei VU\j'%QTUSeQTQj U^dU
S_^dbQce f_\e^qQT% ^_`eUTU^UfYQb_4_ XQSUbQc TU e^Q

@\%Ubd\T\U\Qf_\e^d\T

9 U \Q] Y] Q] Q ^ U LOQ% Y \Q C S_cQ C % U ^ U _ c] Y] _ c ReU ^ _ c i TU C U Q R \\ U C % _ ^ Q R C_\edd] U ^ U \\ J \\ _ c Y R \\ U M S_ ^ e ^ Q Y] \ _ c Y R \\ Y T Q T U ^ C U \ Q X E] Q ^ Y T Q T U ^ C U \Q X E U \\ Q X E U \\ Q X E U \\ Q X E U \\ Q X E \\ Q X E U \\ Q X E \\ Q X E U \\ Q X E U \\ Q X E \\ Q X E U \\ Q X E U

MdJ RY \Le \TSQT_\\Q\relyTUCLYST_S] x\signed cyu,XQSUb\C S_cCc U\cu] Y] Q: ReU\Q\signed \underline{U} \cdot \underline{U} \underline{U}

@\\#Uadot TU\Qf_\e^dot ?_^QX\Q^^: Tg\Q\$Tc

aeUTURUcUb%aeU^_`eUTU^UfYdpU_c%G^QcUb%YU_c_^_TTUCUQ^:c^QXQRQX% SbusUs_^^_c_d_c% cUfUBW_bjQTQ`_b

BeUTURUcUb%aeU^_`eUTU^UfYdpU_c%G^QQcUb%YU_c_^_\TUCUQ^:c^QXQRQX% SbusUs_^^_c_d_c% cUfUBW_bjQTQ`_b

BeUTURUcUb%aeU^_`eUTU^UfYdpU_c%G^QQcUb%YU_c_^_\TUCUQ^:c^QXQRQX% SbusUs_^^_c_d_c% cUfUBW_bjQTQ`_b

BeUTURUcUb%aeU^_`eUTU^UfYdpU_c%GQ^QcUb%YU_c_^_\TUCUQ^:c^QXQRQX% SbusUs_^^_c_d_c% cUfUBW_bjQTQ`_b

BeUTURUcUb%aeU^_`eUTU^UfYdpU_c%GQ^QcUb%YU_c_^_\TUCUA^:c^Q_LUCUA_c_D_c

@S_~Uhww^XQRXdeQ\aeuUccds U^\Qc] U^duc TU\c X_] Rtuc U^dbUY^dQSXQRXNTQT i Uc_c dt ii] Y_c QYduc] U^SY_^QT_c%URU%_
`eUTU%_`eUTU%_`eUTU%_L ~USUCQX_%] `_cYR\U%~UFXQR\U% S' cUfeUfU] ei \eUdbUY^dQSXQRXNTQT ~QdebQ\bu \bu \d_S]_ cVI] \bu \c X_] Rtuc
S_] YU^j Q^QecQb\Qbdg w^i U\XQR\Q%dbU^U^_SQc*w^TU UhSecQdcU%TU\Q ^USUcYTQT ~QdebQ\bu \bu \bu \c \d_S]_ cVI] `bucd_c dt ii] Y_c%u^
*e] Ub_c_c SQc_c &B__`eUT__XQSUb_4B__`_TbuQQ eTQbU Md_TQ\QXe] Q^YTQT dbU^_SQc*w^S_^ddydi TYdy_aeU`eUTU^ecQb
\tigcuc U^ucdu cU^df_%QUhSecQdcUi _db_c%u^SQc*yd_TQc \Qc `\bu_Se`QSY_^uc TU\Qf\fTQ%s_^bbc\useu^S_\bu \bu \c \d_Q\Qc TUSU\SY_^uc i \Qc S_cQc
\tigcuc SUTU^%aeU` \bu Se`QY i QUESQV^Q^_c_db_c] Yc]_c i Q_c TU] sc%aeUc_^XXXU^dbc__TbucQRQR\U`QxQ^_c_db_c_U_c%
S cQc TUCUQR\Uc%aeU^ c db c e db c 9 Uc`YcdU

 $EeUe^c CubQS_cde] \ RbQT_Qe^Qe^w^TUYTUQc TYMUbU^dUcYTUcTUQ^bij UbQY^Q^SQWQSU aeU^QS_^UhW^CXQRYbeQ, UhdbU] \ QTQ] \ U^dU VeUbdUc%S_]_cYdQ, S_^UhW^cUTURUQ^Q^QbbQUj Q%U] \ Q^WXUcdQU^Y^e] \ UbQR\UcSQc_c': c TU\\d_T_`_be^QS_^UhW^TUUcdU\dY_XQRYbeQ, TU\\Qc YTUQc%aeU_c X_] \ RbUc ZeUj TU\QWQYTUj Q_\Q \Q TCdQ^SQTU_c _RZbd_c TU\Qf YcdQWTUcTU ce Q`QbS\w^D_b_ dQ^d_%cUTURU Qe^QS_^Uh\w^UcdQR\USYTQdQUc$ `bYSY_C% SbUSYU^T_S_^e^Q`Ubc_^Q\aeUZej WQQe^Q]_^dQVQ\aeUf UQ\Qc TYU AYUC 9YcdQ^SU\QcUb] \ sc \WQ^TU \ aeU\Q^Qbij \\ \\ \g_1 \ sc \\UZ_c \ aeU\U, \W^Q\TU\Q] \\ Y_1 \ Q \ 9Uc` \ et c TU XQRUbc\T_ed\y'QT_dQ^d_dU_\cY_Q \ e^\YcU\Qe^QTYcdQ^SQi] \ QWYdbTS_^cYTUbQR\US_^dQ\Q \ QbU^SQ\\ \\ \g_1 \ RbUc \\ \g_1 \ QWYQbaeU Uc`_be^TYSdQT_TU CU^\dT_^QbbQ\\ \g_1 \ \\ \g_1 \ \\ \g_2 \ \\ \g_1 \ \\ \g_2 \ \\ \g_2 \ \\ \g_1 \ \\ \g_1 \ \\ \g_1 \ \\ \g_2 \ \\ \g_2 \ \\ \g_2 \ \\ \g_1 \ \\ \g_1 \ \\ \g_2 \ \\ \g_2 \ \\ \g_1 \ \\ \g_2 \ \\ \g_2 \ \\ \g_2 \ \\ \g_2 \ \\ \g_1 \ \\ \g_1 \ \\ \g_2 \ \\ \g_1 \ \\ \g_2 \ \\ \g_3 \ \\ \g_1 \ \\ \g_1 \ \\ \g_2 \ \\ \g_2 \ \\ \g_2 \ \\ \g_3 \ \\ \g_1 \ \\ \g_1 \ \\ \g_1 \ \\ \g_2 \ \\ \g_2 \ \\ \g_3 \ \\ \g_3 \ \\ \g_1 \ \\ \g_1 \ \\ \g_1 \ \\ \g_1 \ \\ \g_2 \ \\ \g_2 \ \\ \g_3 \ \\ \g_3 \ \\ \g_1 \ \\ \g_3 \ \\ \g_1 \ \\ \g_3 \ \\ \g_2 \ \\ \g_3 \ \\ \g_3 \ \\ \g_1 \ \\ \g_1 \ \\ \g_3 \ \\ \g_1 \ \\ \g_1 \ \\ \g_3 \ \\ \g_1 \ \\ \g_2 \ \\ \g_2 \ \\ \g_3 \\ \g_3 \ \\ \g_3 \\ \g_3 \ \g_3 \ \\ \$

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\$_cQ:\%_^U,\Y^TU\Z\b] Qbce ^_\$\rangle TU\J] `Ub\U\$\$\rangle Se\`QR\\JTQT`: _c ^_Uc`UbQ^XQcdQaeUXQ;Q^TU\$\JT\T_`_bcec bU\Y^QT_c_ aeUTUdUdj YQU^`bij Ub\eWQb\Qf \e^dQT4cYcU`eUTUTUdUdj YQb` bQW UhdurcUSQ YdurcUSQ4cY\Qf \\SWrTUdUdj YQ\Qf \\SWr% _cYQS_]`bu^cYw^TUdUd;Y^Q\Qf_\e^qQT4cYXQ;Q\We^QS_cQdQ,S_]_]UdQ\cYs_cU^dU^TU^_bS_^dY\WU^SQ\#YdU^U^Q\\% $\label{eq:cwmbgqt} $$ \text{cWMbgqt}_{A} = \text{cpt}_{A} \ \text{c$ `b_`Y_c Q5d_c TU c_RUbQ^uQ%aeU Q`_baQ Q`QcQbd_T_c cec `b_`Y_c Q5d_c c_RUbQ^_c' : _c ^_d] Q^ ^YW6^Q`QbdUTU ce ^_SW^TU $\label{eq:continuity} $$ \Q_Se^Q_Se^Q_D = \Q_E^Q_E - \Q_E^Q_D -$ $\label{eq:condition} $$Xe] Q^TQT%_fUSU^d_c ^fUSQT ^eUFUTU SQTQ] $$\%eUfYU^i] eUU^c^dU^Ub^YWe^Q ^SW^S_]_ QTUSe(`QSQTQFU] aeUU^cYWe^Q ^SW^S_]_ QTUSe(`QSQTQFU] aeUU^cYWe^Q ^SW^S_]_ QTUSe(`QSQTQFU] aeUU^cYWe^Q ^SW^S_]_ QTUSe(`QSQTQFU) aeUU^CYWe^Q ^SW^S_QTQFU) aeUU^CYWe^Q ^SW^S_QTQFU aeUU^CYWe^Q ^SW^S_QTQFU) aeUU^CYWe^Q ^SW^S_QTQFU aeUU^CYW^S_QTQFU ae$ UndtQ Un\Q SQRU j Q% cyndQnd S] en aeU dtUnU SeQaeYdb S nSU' StwnaeU SeQaeYdb SeUto TURuQ cUbi Q cUQ Se\`QT U\ WtQT `_bSeQaeYUbS_cQ DQQQUcdQbcUMeb_TUaeUcUbQe^\QbW_dtU]`_QYdUcTUaeU_cX_]RbUc\\UMQb_^QdUYUbdQuc^_SY_^Uc' $8_ \land \forall TUtQ \land TUtQ \land$ $\verb|cu|| L _Sebb2\% ^ XQRQ @ GebQbU^d_TQ: |Q: SbQbbQc |QSY^QUL% ^Q CU^cQSW^TU TULYUbd_! |M%TU:TU|eUM_%U^QV_b] |QSW^TU |Ce|| CSW^TU |Ce||$ ^_SYW^TU\Q] Yc] Q%aeU^_ XQSU^ec_ TU\Q] UdQVcYSQ H_T_ U\ceU_ aeUfQ QQS_^cYcdUU^aeUUcdQc T_c S_cQc%QUh`UbXU^SQ% e^QcU^cQSW/^QtekQ,TU e^QSWtaQQ`ddeT QWtQTQRY(TQT aeU XQ`U^\Qe^Yw^TU dQUc]Q,] bQ,S] Ucals TUcSbdQQ^dUbY b]U^dU% Uc TUSY8/e^cUb_ XQ\$UbU\,] Q\,S_^\Qf_\e^qQT% U\,\bUcU^d;\ YU^d_U^_c TU] sc% U\,T__bY\\\WT_Q\Q`\Ucc_^QU^aeYU^UcdU] Q\]_bQ\Uc'oEet cU^dT_^QabbQ\Uc_aeU\\Q]Q]_c`_bU\^_]RbUTU\QS_^SYU^SQ

TSQT_c`b/SYQUcTUcU^df_S_] x^%LcTUSY%eUd_T_\aeUU]`YUjQQcUb%UU^UQWe^QSQecQ_bQw^`_b\Qw^`_b\QaeUUc'

@QWWYdUS_] x^%u^ce ^_SW^TU e^QUcSb&bbQ_U\ddQRQZ_TUVUSde_c__TWYQTUU_W_XISSQ_``_bSeQaeYUbQ%_ ce`_^U^aeUU\
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TU XQSUb_ aeU\\U`\Q] SQ B__dU^U^\TUQTU\Q\\RUbdQT aeUS_^c\cdu\U^\Q\`bi_U\dQSb\\CaeU\SW^TU\Qf_\e^dQT% Qcu\SQecQbcec`b_`Y_c
QSd_c4i TUdUb] Y^Q\$% Qcu`b_f_SQ^T_ cec`b_`YQc TUdUb] Y^Q\$Y_^Uc4_\QU\USS\W^% Qcu`b_f_SQ^T_ ce`b_`YQU\USS\W^* HQ\^_S\W^TU
\\RUbdQT Uc_ aeU ^Y\We^_ dUU\W\U_\CaeU\XQ^_cSebUS\T_ ce`b_`YQ] U^dUS_^\QUC\USS\W^* [UbQ\XC\SQS_^\ecQ%

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⇒GYVéUcUYS]`QXRVUS^U\cU^XfT_S]x^TU\QXe]Q^YTQT%ieU\cX]RbUcTURU^cUb\QSe\`Q_U\WQb^U^SeQaeYUb f_{NSY} 'Uc aeU dU'U' _ TUU TU Q,SQ') Q5%U' SQc_ TU 'USUCYTQT] _UQ,_ Y] `_cYRYYTQT4U'd_'SUc cUWeUQ U'dU dU] RYL' CUb QSU`dQR\U`QtQU\]`t] cU^df i \QtQjw^TU\QXe] Q^YfQT%eUSeQ^d] sc SUt6QU\SQc cUQSUt6QQe^Q^USUcYTQT \{\rightarrow{\gamma_\rightarrow 'ij` cYRYKTQT% b`U^cYx^i \QTW56\dQT3iQaeUUce^TY5dQT \\Q^ebQTU\cU^dT TUdTQ\QXe]Q^YTQT%aeU\Q^USUcYTQT^QæbQ\ aeU \Q ^USUcYTQT] _bQ, TU XQSUb_ YJ `_cYRYYTQT TU UFYQbaeYQQ_T_ U_WY_i \Q SU^cebQ% QaeU \Q ^USUcYTQT ^QdebQ,_ 'ij` cYRYKTQT XQSU Ucd 4U^d ^SUc% be^Q`QXTQT`UXUSQDTU\QbQjw^%cUbuQqQ^d U\TYSQDT TU\cU^dXT S]x^%aeUe^U^VaeU ^QuebQ,U^j_`_c/R%YTQT XQSU':c YMeQ,] U^dU/Qf_j TU/cU^df_ S_] x^%aeU/Qc`Uloc_^Qc c_^UhSecQR/Uc%U^`QodU%Q,TUcSeYTQb /QcS cQcTWbSKUcS_dbQTU cef_/e^dQT%6]_aeUc_^UnSecQR/UcU^ced_dQXYQTQTQtTUcSeYTQbS_cQcYj_`_cYR/UcS_dbQTU ce $f_{e^{0}} = f_{e^{0}} = f_{e$ $cUQ^ \land QdebQUc\ U^ S_ \land dtQTU\ Qf_ e^ dQT' \underline{\ \ \ } \ \underline{\ \ \ \ } \ \underline{\ \ \ } \ \underline{\ \ \ \ \ } \ \underline{\ \ \ \ \ } \ \underline{\ \ \ \ \ \ } \ \underline{\ \ \ \ \ } \ \underline{\ \ \ \ \ } \ \underline{\ \ \ \ \ \ } \ \underline{\ \ \ \ \ } \ \underline{\ \ \ \ \ \ \ } \ \underline{\ \ \ \ \ \ \ } \ \underline{\ \ \ \ \ } \ \underline{\ \ \ \ \ } \ \underline{\ \ \ \ \ \ } \ \underline{\ \ \ \ \ } \ \underline{\ \ \ \ \ \ } \ \underline{\ \ \ \ \ } \ \underline{\ \ \ \ \ \ \ } \ \underline{\ \ \ \ \ \ \ } \ \underline{\ \ \ \ \ \ \ \ } \ \underline{\ \ \ \ \ \ \ \ } \ \underline{\ \ \ \ \ \ \ } \ \underline{\ \ \ \ \ \ \ } \ \underline{\ \ \ \ \ \ } \ \underline{\ \ \ \ \ \ } \ \underline{\ \ \ \ } \ \underline{\ \ \ \ \ } \ \underline{\ \ \ \ \ } \ \underline{\ \ \ \ \ \ } \ \underline{\ \ \ \ \ } \ \underline{\ \ \ \ \ \ \ } \ \underline{\ \ \ \ \ \ } \ \underline{\ \ \ \ \ \ \ } \ \underline{\ \ \ \ \ \ \ \ } \ \underline{\ \ \ \ \ \ } \ \underline{\ \ \ \ \ \ } \ \underline{\ \ \ \ \ } \ \underline{\ \ \ \ \ } \ \underline{\ \ \ \ \ \ } \ \underline{\ \ \ \ \ \ } \ \underline{\ \ \ \ \ } \ \underline{\ \ \ \ \ \ } \ \underline{\ \ \ \ \ } \ \underline{\ \ \ \ \ } \ \underline{\ \ \ \ \ \ \ } \ \underline{\ \ \ \ \ \ \ } \ \underline{\ \ \ \ \ \ } \ \underline{\ \ \ \ \ \ \ } \ \underline{\ \ \ \ \ \ \ \ \ \ } \ \underline{\ \ \ \ \ \ \ \ } \ \underline{\ \ \ \ \ \ } \ \underline{\ \ \ \ \ \ } \ \underline{\ \ \ \ \ \ \ } \ \underline{\ \$

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] Y; Q4#E eU%lic SYbdi_%cUce`_~Ufe\Wddj U^dbU^Y^e] UbdR\uc SQc_c%%c^Uj RQbW_%_cUce`_~US_] x^] U^dD\aeU_c
] Y; Q4#E eU%lic SYbdi_%cUce`_~Ufe\Wddj U^dbU^Y^e] UbdR\uc SQc_c%%c^Uj RQbW_%_cUce`_~US_] x^] U^dD\aeU_c
X_] Rtluc c_^TMW_c TUU_VW__cY_] U^_c`tluSY_TU_dQ\uc TY:_CSY_YUc46` \ucQbTU_aeU\uc AqebQ\uc Y_*SY_P\uc Y\endote Y_J RtluseU`QtuSU_cDTU
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 $$$ $$ TeSdDTUe^X_{1} Risu^* ubutsdD_{1} U^*dUTU_{1} t_{Q}^* ut_{Q}^* ut_{$

 $6 \text{We} ^-\text{c} \text{`QtbU}^\top \text{UTU-TU-Qb} \text{QT'cd'SW}^\text{aeU} \text{XQSU}] _\text{c} \text{U}^\text{d} \text{U}^\text{SUc} \text{TQT} ^\text{Qte} \text{Q}_i \text{ }] _\text{cYcU} \text{dd} \text{Q}^\text{d} \text{Q}^\text{TU} \text{d}^\text{T} _\text{I} \text{`Utd'U}^\text{U} \text{U}^\text{U} \text{Cd} \text{Q}_i \text{ }]$ S_fdb_fdbcxQ8 _aeUUc ^USUcQb<u>x</u> #7\$U^aeU\$Uc ^USUcQb<u>x</u>4aeUUc _aeUTURU cUb% ^_c tU`eUTU`bUFU^b M_aeUUc \}`_cR\U%\L`\}`_c'R\U% ^_ cU`eUTU XQSUb3i`_b_dQYd_^_`eUTU cUbU\Se\`QR\UTU^_XQSUb_% UcdQcS_]`QbQSY_^Uc cU XQSU^ec_TU%_]_U\]QYT_TUe^X_] RbU U^SQ| YQbaeUXQ`UbTYT_cec`YUb'Qc%| S_~TU^Qbi SQcdWQbQ`_b^__RUTUSUb4QtbQdf_i TU!bUaeUbbQe^X_] RbU aeU Ucd; U^SUbbqT_U^e^Q `bbtw^\&Ubdl/%QbQfU^b%\ S'G^U|RQbW_%\^UcdQcS_cQc%Qb|Y^Q^_cc_^]ei`_S_bQ|_^QR\U'9UbZJaeUU\,cU^dff_S_]x^TUdUb|Y^QbscY^_ $XQ_iQ_i^* eUcd_iQ_iUe^*bQ_i^*M_iU_if_iU^*UQ_iV_i_iQ_iQ_i^*Q_iUf_iD_iV_iU_iU_iV_iU_$ `UBTW%LUs`UBT_^QT_i`eUcd_U^\RUbdQT% dQ] RYL^cUbU^bbeUSYT_U^WQ^]UTYTQ% QfQ^jwQSe]`\Yb4U,`bcY_^Ub_TUS_bQjw^cUQbU`YU^dU `Qbutuc \euladuc%_^`eulado: TURb_^SU%; RQbdo: TUXYbbb_': _bb_SQc_UcU, TUe^X_] RbuaeUUcTUe^Uc`bbde]eibQj_^QR\U%TUe^Q $Tt^* = SM^2Qb_WQ^dU^3YWQd_3^2 dU^3Y_Q4i \%_b_dQ^* QbdU^6U XQSbQT_U^* b^*SYY_c ddQT_bUc% XQ^* = LbQ w^S_^eQU^U_1 YcdQT_bUc% XQ^* = LbQ w^S_0 YcdQ^W_1 YcdQT_0 YcdQ^W_1 YcdQT_0 YcdQ^W_1 YcdQT_0 YcdQ^W_1 YcdQT_0 YcdQ^W_1 Ycd$ Undtill QUYFULLIQTQQce\unitedit_c_c_RUtQ_4i `_bce tURU\w^ucd; USXQT_UY\QSst5U% cUUYSeUYdQcYU|`tu\Q\\%QXWT_TUSQTUYQc `UcQTQc% U^St5e^cdQ^SQc] YcUQR\Uc' D bYY%\,`brSYUS]`QcYQdQdQTU\Q`bCYV%bTU^QQcecSQTU^QcQcUbTUbBRQT% cec`eUbdQc \Q`bichm^saeu cu ucadRnuj SQ^Tu`qbu^`qba\qc \\Qj \qtqc Qt\% \UT\SU%Yt\cq\Tbs Qt\% SQubTuQ^duTut\%bL5_^SUbaeu_XQ dbqdt_ YTHWYQI U^dU% `UTYbce `UBTW'%LUbs `UBT_AQT_ Δ _AUbU^\RUBDDT% cYBQT_U^e^\eWQbTU.WEQ^THWYTQT i U, RU^UXBY_U^ce S_bdU^DUb_t\Uc \eutrali cdj qsx\e\% \\u^_tuj q\x\v*intot c_Rubry_%eu^_`eutu ucaqbtx`eucd_qqsv aqb\q_\ubaqsce qbbqxnot_\e\ubau_b\e_i] q\sq\atu-u^ $e^{-}_{TUb} `UbUSd_c_RUlt\% `_bQcuTUSb_cUe^U^Qt\% UTQ^dU\Qe^m^TUce S_lQ; w^3VQ_`_cMM^TUce S_lQ; w^dU^UU,T_] YY_c_RUlt\% \\$ $aeUdU'Ue^QY'WeU'SQU'ce]U'dU]eice`Ub'_bQ\QVWQSQiS_"TUCSU'TU'SQTU, bU'\%Qd_T_ccecQ[QR\Uc_wbbc_i`b_]UcQ:'6X_bQ\%bUcqc'sQY'WeU'SQTU, bu'\delta CcecQ[QR\Uc_wbbc_i`b_]UcQ:'6X_bQ\delta CcecQ[QR\Uc_wbbc_i]UcQ:'6X_bQ\delta CcecQ[QR\Uc$ $QSU'dQRUU'QQU'CU''dRT_S_1 \times ^ QQQQMG|Qbi aeUcU' ec'YLcUQU'\QY%aeU' ^ XQi TMULU'SYQU''dBUUcd_c T_c SQc_c%6_1 _ QSeQaeYUb] tbld_TU'QV_CY%aeU' ^ XQi TMULU'SYQU''dBUUCd_c T_c SQc_c%6_1 _ QSeQaeYUb] tbld_TU'QV_CY%aeU' ^ XQi TMULU''SYQU'' dBUUCd_c T_c SQc_c%6_1 _ QSeQaeYUb] tbld_TU'QV_CY%aeU' ^ XQi TMULU''SYQU'' dBUUCd_c T_c SQc_c%6_1 _ QSeQaeYUb] tbld_TU'QV_CY%aeU' ^ XQi TMULU''SYQU'' dBUUCd_c T_c SQc_c%6_1 _ QSeQaeYUb] tbld_TU'QV_CY%aeU' ^ XQi TMULU''SYQU'' dBUUCd_c T_c SQc_c%6_1 _ QSeQaeYUb] tbld_TU'QV_CY%aeU' ^ XQi TMULU''SYQU'' dBUUCd_c T_c SQc_c%6_1 _ QSeQaeYUb] tbld_TU'QV_CY%aeU' ^ XQi TMULU''SYQU'' dBUUCd_c T_c SQc_c%6_1 _ QSeQaeYUb] tbld_TU'QV_CY%aeU' ^ XQi TMULU''SYQU'' dBUUCd_c T_c SQc_c%6_1 _ QSeQaeYUb] tbld_TU'QV_CY%aeU' ^ XQi TMULU'' SYQU'' dBUUCd_c T_c SQc_c%6_1 _ QSeQaeYUb] tbld_TU'QV_CY%aeU' ^ XQi TMULU'' SYQU'' dBUUCd_c T_c SQc_c%6_1 _ QSeQaeYUb] tbld_TU'QV_CY%aeU' ^ XQi TMULU'' SYQU'' ABUUCd_c T_c SQc_c%6_1 _ QSeQaeYUb] tbld_TU'QXAEU' ^ XQi TMULU'' SYQU'' ABUUCd_c T_c SQc_c%6_1 _ QSeQaeYUb] tbld_TU'QV_CY%aeU' ^ XQi TMULU'' SYQU'' ^ XQi TMULU'' SYQU'' ^ XQi TMULU'' ^ XQi TMULU'$ Sel'QTU\c'bisy_rub_c4'_baeU%SUba0] UndUNUhriduenQ rusuchTQT UniQl R_c% UnQSd_cU bUaeYUbU UnSQTQSQc_ucij_`crR\us:cSVbd_% QQc \text{UcdU.x/df}__SQc_%UT15U.aeU.Uc YSQ`Q; TU_RUTUSUb\Q_bTU^%U.ed\Y;Q\QUN`BUc\W^YQTUSeQTQ% ^_U^U,cU^df_aeU.db^UU^e^`b\^SY`Y_% U^ $\label{thm:linear} $$ U_{U}^{\prime\prime}(x) = U_{U}^{\prime\prime}(x) + U_{U}^$ \s5\f\ U^dUc\f\U`\Q| \$Q4Qe^aeU`_bbQ| w^TUce Xe] _bTU`Ubb_c TU\\$_bQ| w^%aeUUc \\Z i QbbQ\f\QT_%bc\f\ `_c\f\UaeU\U \\ext{We}cdU] \$c5 aeU ^ XQi $\label{eq:condition} TWUU'SQU'dUUUd_c T_c SQc_c\%_] = QSeQae'Ub] \ t \ bd_TU \ QSe(`QTU_c `bb'_Ubc4`_baeU'\SDUUDCU' U'\UV\bh'CU e'\Q 'USUC'\TQT U'\Q] \ R_c\% \ U_L \ d'_Ubc4'_DaeU'\SDUUDCU' U'\UV\bh'CU e'\Q 'USUC'\TQT U'\Q] \ R_c\% \ U_L \ d'_Ubc4'_DaeU'\SDUUDCU' U'\UV\bh'CU e'\Q 'USUC'\TQT U'\Q] \ R_c\% \ U_L \ d'_Ubc4'_DaeU'\SDUUDCU' U'\UV\bh'CU e'\Q 'USUC'\TQT U'\Q] \ R_c\% \ U_L \ d'_Ubc4'_DaeU'\SDUUDCU' U'\UV\bh'CU e'\Q 'USUC'\TQT U'\Q] \ R_c\% \ U_L \ d'_Ubc4'_DaeU'\SDUUDCU' U'\UV\bh'CU e'\Q 'USUC'\TQT U'\Q] \ R_c\% \ U_L \ d'_Ubc4'_DaeU'\SDUUDC' U'\UV\bh'CU e'\Q 'USUC'\TQT U'\Q'\Bell' U'\UV\bh'CU e'\Q'\Bell' U'\UV\bh'CU e'\Q'\Bell' U'\Bell' U'\Bell'$ $QSd_cU_bLaeYUbU_0^SQTQ_SQr_Uc~Y_1^*_c^*RV_U5:c~SYUbi_2^* QQr_Trc^*_c^*SY_^*Uc~TU_e^*X__]~RbU^*_eUTU_cUb_dQ^^*_bubU~1Y_1^*_eUR_Uc~S__]~_\c SUbb_Z^c~TU$ $QSsjQbDUb_aeU ^_`eUTUfUb%aeU SeQ^T_e^X_] RbU%U^UcdU x\df] _ SQc_%cUTYSU aeUUc YSQ`Q] TU_RUTUSUb\Q_bTU^%cU ed\f(YQQUh`bUcYw^AUCU x\df] _ SQc_%cUTYSU aeUUc YSQ`Q] TU_RUTUSUb\Q_bTU^%cU ed\f(YQQUh`bUcYw^AUCU x\df] _ SQc_%cUTYSU aeUUc YSQ`Q] TU_RUTUSUb\Q_bTU^%cU ed\f(YQQUh`bUcYw^AUCU x\df] _ SQc_%cUTYSU aeUUc YSQ`Q] TU_RUTUSUb\Q_bTU^%cU ed\f(YQQUh`bUcYw^AUCU x\df] _ SQc_%cUTYSU aeUUc YSQ`Q] TU_RUTUSUb\Q_bTU^McU ed\f(YQQUh`bUcYw^AUCU x\df] _ SQc_McUTYSU aeUUc YSQ`QQ TU AeUUC YSQ`QQ$ $\verb| YQTUSeQTQ% @ U^U CU^dIT_aeU dU^U U^e^` b^SYY_% U^U V^WeQZUS_] x^4i aeU QTUSeQTQ] U^dU cU`eUTUTUS'baeU Ucd<math>D$ bU^U V_i _TUbTU _c tURU,TUC QCQ\bTU\Q`bC\n^9i\, fUb_aeU`eUTU XQSUb\sS\| U^U\c\U`\Q`SQ4Qe^aeU`_bbQ; m^TUce Xe] _bTU`Ub_c TU, S_bQ; m^9ieUUc \notine{L} i QbbQMQT_%Uc'l]`_c'R\UaeU\UWecdU] sc5 aeU^_XQi TWUbU^SXQU^dbUcd_c'T_c'SQc_c%6_]_QSeQaeYb] t bbd_TU\QSe\`QTU_c`bbcY_^Ub_c4 `_baeU%S\ubaQ} U^dU%Uh'cdUe^Q^USUcYTQT U^Q} R_c% U\Q\$d_cU!bUaeYUbUU^\$QTQ\$Qc_Uc'}`_cYR\U5 : c\$Yubd_%} QQcT\c'_c'\$Y_^UcTUe^ $X_[RbL)^* e U T U C U b d Q^* \& U d U U Y] = e U R U C S_[_ \ C S U b _ Z C T U Q S G U D U b_ a e U ^_ ` e U T U f U b % e U S e Q^T _ e ^ X_[RbL)^* U c U u x \ d i _ S Q C _ % U U S G U B U A C$ $TSU a eUU CYSQ`Q`TU_RUTUSUb\Q_bTU^% U edity`Q\QUh`bUc'w^YQTUSeQTQ% ^_U^U, cU^dT_a eUd'U^UV^e^`bh^SYY_% U^U, \UVWeQZUS_] x^4$ i aeU QTUSeQTQj U^dU cU`eUTU TUS'baeU UcdQbU^U,`_TUbTU_c tURU\TUc Q cQ\bTU\Q`bC\w^%Q,fUb_aeU`eUTU XQSUb\sSXj U^dU cY\U`\Q; SQ4Qe^aeU`_bbQ; w^TU ce

G_RbUU, d_T_%ee`_^W_aeU^_XQ; ^^We^Q`Ubc_^QTUReU^U^dU^TN] YU^d_%aeU cY^QSU`SW^S_^cYTUbQ\QcS_cQcaeU cU XQ^_RcUbfQT_% Ub_f_i Q`Ub] Ydb%aeU^_ Uc UFYTU^dU%Q`QbdbTU_c TYSQT_c TU, cU^dT_S_] x ^%_ ^_SY_^Uc ^QbbQUc TU \QXe] Q^YTQT%aeU]_bQ, ^USUcYTQT Uc Y^S_] `QdR\US_^U_WY_i Se\`Q M%_b_ dQ^d_%cY_c Qb] Y^Q^_c `b_RQbQSeQaeYUb Y^S_^cYcU^SQ%TURU cUb`_bQWe^_c QbWe] U^d_c WY_cwWS_c i] UdQwcYS_c% ^_ U, cU^dT_S_] x ^ @\\ruadpt \tau\qf_\e^dqt ?_^QXQ^^: Tg\QbTc

GUSSYu^I'

8_ htt: \understand \text{QLCQCONTOTIONSQT_\(\) \understand \und

@\\RUMDTTTU\Qf_\e^dDTC ?_^QX\Q^^: Tg\Q\$TC

 $\begin{aligned} & \mathsf{DQQQ} \setminus_{\mathsf{C}} \, \mathsf{UCVeUtj} \, |_{\mathsf{C}} \, \mathsf{CUQ} \cap_{\mathsf{C}} \, \mathsf{A}_{\mathsf{C}} \, \mathsf{A}_{\mathsf{C}} \, \mathsf{C}_{\mathsf{C}} \, \mathsf{U}_{\mathsf{C}} \, \mathsf{U}$

6X kg% b\ dg^d %g`kuwe^qgaeuTuru kuc` ~Tubcu%f5 ^u, V/^TuTudubj Y^qb%gYcu cYfweuTu ucdqT Sdb^qTu\qs ^uhw^ ^USUCQXQU^ddJ/QcS cQcaeUQ^dUSUTU^i \ cS ^cYWeYU^dUc%aeUcYWYW5QedKYQbS ^U, VY^TUSeQaeYUbUVU5d c ^] sc YxdKTU _ aeU cubiQ^TU_dtQ] Q^UtQ \$%Uc TUSY%{YcU cYMeUTU U_ aeU XQ;] U^_c TU\QS_^UhYw^Q^dUc] U^SY_^QTQ U^dtU_c] UTY_c i UNUSd 4Uc TUSIX%YNU^U, ce`eUcd TU aeU UhYdqDe^QS ^UhYw^bUQ,i fUbTQTUbQU^dbU] UTY c i UNUSd %aeU U^U, ce`eUcd TU aeU ^ Unitarys ^Unitary N@QU^abU \q; S cqc q^absuttu^abc i \ c S ^cbseb^abc4i \q] \text{k} qy Yttsq/tt tu bcap`buwe^aq bc ce\nsyb^ab `QtQtJuC`_~TUbQU\\Q`9URU`Q`QtuSUbQd_T_QaeU\aeUTUcUUQRbbcec_Zc%aeUUcdQSeUcdw^^_cU`eUTUQXbJ_QbcY^U\QRcebT_] sc Wb cUbQ UY'S ^cYcdU^SYQ @ c] UTY c c ^aeU Q^dUSUTU S cQc% \ c UVUSd c Ucds^cYWeYU^T S cQc! M cY^ XeRYUbQS ^UhW^ Yxd(UY\YbeSdecQDQtQaeUUcU^fYbbeTTUcw\QWe^cTUS^UhYw^%aeUcUS^fYbbdU^U^e^thYd'GURcUbfQSYbbdQS^UhYw^ _ BUFUQT_% S_^SUTU_dbQ]Q^UbQ%U^dbU/QcS_cQcQ^dUSUTU^dUic%WeYU^dUc%Uc_Uc_aeUTY8WWU^\QU\USSW^TU_c]UTY.c' $\label{eq:mcy_loss} $$ McY^_XeRYDDQ.dQ,S_cQS_] = e^QS_^UhYM^UcdQR/USYTQ%_`eUTU XQRUDUUSSYM^U^SeQ^d_Q_c] UTY_c4e^QS_cQ^_dU^TDdQ.$] scdu^TU^SQQe^U\USd aeU_db4XQRbQaeU^ XQ;dQ\S cQS] _\QdU^TU^SQU^U\SQc ' H TQcUcQcS cQcaeUc ^] UTY c $\label{eq:continuity} \text{Lind}_{CQ:} \text{TU_d}_{QC:} \text{S_cQ:} \text{$$^{U^*U/QTU}$] eUcddQ^QdUSUTU^dUc $$^{USdQT}_{C} \text{$$^{USdQT}_{C}$] eUcddQ^QdUSUTU^dUc $$^{USQT}_{C} \text{$$^{USQT}_{C}$] eUcddQ^QdUSUTU^QUC $$^{USQT}_{C} \text{$$^{USQT}_{C}$] eUcddQ^QDUSU$ $\label{eq:linear_control_control} $$ U_N^{\prime\prime} L_{C}^{\prime\prime} = V_{C}^{\prime\prime} L_{C}^{\prime\prime} L_{C}$ 'ij' `UT\be^QS_^Uh\w^U^dbUQ^dUSUTU^dUc' i S_^cUSeU^dUc' 8_] _ dQ| `_S_ ^YW&^Qce`eUcdQS_^Uh\w^TU\QceSUc\w^_ U\dU^TU Qndusurrunduc i s_ncuseunduc%ructru u, binsy y_tru d_troc \ocuse_cqc%Qs_nuhwn cu ucas buqy qnt_ i qcuweb_ i nusucqby % Q `TUbTYY^%U/aQUcidQUc SQcY^Uc% TU SeQaeYUb ddQ] Q^UbQ#EYSeQaeYUb db XQiQ\$49YW%^XQidQ\S ^UhYw^^USUcQbQ $TUe^QcUbUTUQ^dUSUTU^dUciS_^cUSeU^dUcU^_]sc]u^\gamma]_`eUTUdU^TU^Q_RcdQSe\\^Qd\^Ub_aeU_c]UT\underline{Y}_caeU$ $edt/YQ]_c `eUTU^ `UddI^USUbQ\QcUbU4i `_b_dQ^d_`eUTU^cUbQWe^_c TU Uc_c Q^dUSUTU^dUc aeU Ucds^S_^USdQT_c S_^_c$ $S_cUSeU^dUC BeUcdo_RZDdf_Uc U^U Seloc_UcdQR(USYT_TU VQc S_cQc' : cVeUgi_c aeU edKj^Qi_c%c_^S_cQc aeU UhYcdU^4i `_b_$ dt/d `UddU^USU^Q\QSQTU^Q\WU^UbQ\TU\ c Uf'U^d c4GU.ce` ^U aeU d TQc \Qc `QddUc TU aeU \QSQTU^QQ cUbS ^USdQT 4i QcucU ce`_^UaeUcUUc\éUtjQ`QtQcUbS_^USdQT_S_^

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Ge`_^VQ]__c e^QS_^Uhw^kUQ, i fUbTQTUb_ U^dbUe^X_] RbUTU dU^Ub_c _Zc QRYUdd_c U^U, TuQ\$ej SQbQ&_^ReU^_c wbWQ^_c TU \QfYcdQ% fUb4_b_ aeU fUbUc S_^USdQT_ S_^ce QRbb_c _Zc% ^_fUbS_^ce cY^QRbb_c _Zc4i dQ] RYt^\QS_^Uhw^S_] _ U^dbUTSX_ e^X_] RbUUcds dbQdQ^T_ TU QRbb_c _Zc% ce bUQ] U^dU XQSUb_3\QS_^Uhw^\ucdgR\USTQ ce`eUcdQU^dbU Ucd_c Q^dUSUTU^dUc i S_^cUSeU^dUc%TUZQbaeU\QS_^Uhw^ccUQ^e^SQdQ^cUMeb_i ^USUcQbY_%c^TETQ ^_ beURQaeU Uc U^fQ^_ `QbQe^X_] RbUU^dQ\Uc SYSe^cdQ^SQc `QbQdbQdQbTUQRbb_c _Zc%6_^U\W^TUfUb3ce _RZbb'_U^UbUSQc_% U\ ec_ TU_c] UTY_c%c\U^T_ U\U\USd_ TU ce f_\e^dQT%_ cUb_] `U\QS_^Uhw^%_ TWSe\dQbU\ thd'

S ^cluseur^sQ4` bulls ^dtqXr %lic flutrqtrutq] ur\du\Q\elutj Qur\s ^dtqTru\QT \$dtrQQtj Yr\Qr\QTUS ^dr\wur\s\Qi \QQed trutlutj Yr\Qs\wr\deluti YS_] `Q\$R\US_^T6XQS_^UnYw^ GY^_ XQi S_^UnYw^ U^dbU Uc_c UFU^d_c U^ U\ aeUfYbeTi U\,fY6Y_S_^cYcdU^%i SeQaeYbbS_cQQ^db5UTU^db4 U^d_^SUc_^_XQ; S_^UhYw^U^dbU Ucd_c UfU^d_c i SeQaeYub] UTY_ _ UcYeUbj_c edity QT_c S_^U, W^TU U\]_c4i cYUc Qcb/QS_^d^eQSw^%\Lcd_c] UTY_c Uith'd4iU^\Q]Yc]Q`b`b5W^cc^]UTYciUc\eUgicYUM5QSUciU^fQ^'GUc\WeUTU`bYSYYcQdJYYQ^QcaeU^ XQiWbQT TUS^UhWw^ $\label{localized localized locali$ QcuU^\] sc] u^ij TU U^TUTU\QY\\eU^SQTUSeQaeYbS cQaeUf\U^UQ`QcQbQ^dUSUTU^dU%TU\QSeQ.\QTUdUj YQSW^TU ce Uh'xdU^SQUc% S_]_ce_SQecQ%%WYMSQ%_ceU,_4`_baeU_XQcdQU,]_]_U^d_%QaeU_Uc_Qcu%_Uc_TU_\RBU_TUdUdj_YQSW^4i_%_b_d0^d_%XQcdQQX_bQ^_XQi_^QTQ TURUOS^cUbd dQ] U^dUU^fQ^'aeU\QTUdUbj Y^QSYw^TU\QUh'cdu^SQTUfYbet U\fYSY^ U^\] sc] u^ij TU' U^TUos TU\QYYVeU^SQTU SeQaeYLbS_cQaeUfYLrUQ`QcQbQrdL5UTUrdUrJTU\QaeU\QTUdUbj\rQSWrTUceUh'cdUrSQUc%]_ceSQecQ%YWYWSQ%_ceU,4`_baeUXQcdQU,]_] U^d_%QaeUUc Qcv%_ Uc TU\RbUTUddd YQSrw^4i %_b_dQ^d_%QcdQQK_bQ ^_XQ ^QTQTU\Q^QbbQ\J QTU\Qf\bdeT_U\f\SY_' M_aeUcU TUTESU/%aeU\Qf\tateTif\tsu^c ^U^QRc\ed %u^^Ywk^WkgT\%TU\U^TYU^T TU% S ^USdQT c S ^%eQae\UbQ\$ ^dUSj\YU^d Q^dUbY b

9 U Qaeuc U TUTESU%aeU $^{\circ}$ 'eUTU $^{\circ}$ %L\^SeQaeYLbS_^CXcdU^SQS_^L\ LicaeU] Q6 bj \nambda \nambda \cdot box \quad \cdot \cdo

@Selucidw^^ LicizY, c.X.] Ributia `eUTU^` b\ dQ^d.] UZ bQblucdQT Sdb/QX&cQRU] ic aeU.] eSXQcT Sdb/Qc f UbTQTLUbQc i cQ^Qc c.^ $\label{eq:condition} $$\operatorname{QRecQT_c4'Ub_\%NQT_Sdb^QTQSeQaeYUb_SQcYw^cw_^ QQTNSXQ] UZ_bQ4_cYM^U, ce`eUcd_TU_VQFUbTQTTU_VQT_Sdb^QXe^ec_TU_UNQS_]_$$$ cub_Qbg__^QR\u5 GYQ\We^^QQ\X6; Qbs%aeU_^__ XQbuQ% Ub_ aeU\\Q ^QxebQ\uf_Q] \c] QTU\\QT_Sdb^Q\uc dQ, aeU\\f\; `bij Qc___SQc\w^ `QbQ\\L_%8U^U $aeUcUbU^*UcdQce`_c'Sfw'4QcQRUb'aeUe^Q^USUc'IQT dQ^YfQbQRUTU \underline{d}_TQc \ Qc S_cQc \ aeUi \ QcUUcdQRUSw'sTURU XQSUbaeU \ QYdUb _c'Sfw^TU$ $\underline{dT_c \setminus_c] \ UTY_c \% L V \& Utj_c \% L^4 \& Utj_c \% L^5 \& Ut TU \setminus_Q \wedge Ut Utj_c \wedge Utj_c \wedge Utj_c \% L^4 \& Utj_c \% L^4 \& Utj_c \wedge Utj_c \wedge$ $\label{localization} $$ \Upsilon^{WWMSQYdU4'}_{baeU} ^ \cdot eUTU^U^QRc_{ed} Q_{dUD}_f QbDQ_U Sebc_i Q_{UD}UTUS_{cQc}UUTUS_{cQc}UDSQc_Sudsqc_Sud$ YTUSRVIJ U^dU`_b^USUcYTQT4i aeU%_bdQ^d_%Uc e^Q_SetQ` QtQ_c X_] RtUc QecQbSeQaeYUb] UTY_`QtQSeQaeYUbW^4`Ub_ce cQRYTebuQ` QtQ $S_{s}^{-1} = \frac{1}{2} \left[\frac{1}{2$ $e^Sebc_\%_-U_V V'' TU ce V''' V''S ec_ce SQc_\%_U_V QX_bb_TU cu] \ \ 'L]_TU]_V UcdQc \ aeU \ cu RecSQQW_V edeb_\%_edf(Y_Q) \ UTY_c S_^U_V V'' TU \ e^Q ULY_C S_0U_V V'' UCdQc \ aeU \ cu RecSQQW_V edeb_M_V edf(Y_Q) \ UTY_C S_0U_V V'' TU \ e^Q ULY_C S_0U_V V'' UCdQc \ aeU \ cu RecSQQW_V edeb_M_V edf(Y_Q) \ UTY_C S_0U_V V'' UCdQc \ aeU \ cu RecSQQW_V edeb_M_V edf(Y_Q) \ UTY_C S_0U_V V'' UCdQc \ aeU \ cu RecSQQW_V edeb_M_V edf(Y_Q) \ UTY_C S_0U_V V'' UCdQc \ aeU \ cu RecSQQW_V edeb_M_V edf(Y_Q) \ UTY_C S_0U_V V'' UCdQc \ aeU \ cu RecSQQW_V edeb_M_V edf(Y_Q) \ UTY_C S_0U_V V'' UCdQc \ aeU \ cu RecSQQW_V edeb_M_V edf(Y_Q) \ UTY_C S_0U_V V'' UCdQc \ aeU \ cu RecSQQW_V edeb_M_V edf(Y_Q) \ UTY_C S_0U_V V'' UCdQc \ aeU \ cu RecSQQW_V edeb_M_V edf(Y_Q) \ UTY_C S_0U_V V'' UCdQc \ aeU \ cu RecSQQW_V edeb_M_V edf(Y_Q) \ UTY_C S_0U_V V'' UCdQc \ aeU \ cu RecSQQW_V edeb_M_V edf(Y_Q) \ edf(Y_Q) \$ $\label{eq:condition} S_cQ \cdot \text{dedet}Q \wedge \text{Sec}_U \wedge \text{ce} \cdot \text{UQR_tQSW} \wedge \text{QUcQS_} \wedge \text{Sec}' \text{W} \wedge \text{meU RecSQts} \wedge \text{QTQ} \wedge \text{U, ec_TU} \wedge \text{W} \wedge \text{Q}] \\ Q' \cdot \text{UQU, W} \wedge \text{TU SeQaeYUbS_cQU} \wedge \text{U, Vedeb_4aeU} \\ Q' \cdot \text{UQU, W} \wedge \text{QUcQS_} \wedge \text$ QSSY_*Uc__S_^SecY_*Uc_TU\Q^eUcddQ%5_^U,\W^TUSeQaeYUbS_cQ\&dbUQU^d_\Suc_dU^UfQ^Qc_d_TQc\Qc_S_^SecY_*Uc_i \QS_^TeSdQTU_c ^eUcdb_c%_^U, W^TU ^eUcdb_\edeb_\Q\$XfTQT'@Q] UTITQTU ^eUcdbQ\Q\$XfTQT%_^U,dU]`_%|_T_i SQTQ\$\bse^cdQ^\$Q\TUaeU%\QUcds\W\$QTQ%_b d_T__Tubbb| YQ\Q^USUcYTQT%bQ^d_S_1 _ SeQaeYbb_dbQS_cQ GYTYSU aeUTU^db_TU cu] Yc] _3 oE et Vb\YSYTQT _1 YbbQ\ebeb_f_i Qdl^Ub%Q $\label{eq:localization} $$\operatorname{ULG}_{T}^{T} \subseteq \operatorname{ULG}_{T}^{T} = \operatorname{ULG}_{T}^{$ $aeU ^- cU ^* eUTU QWLWQbQTUdUb] YQT_ WQT_ TU VU\YSTQT\%_ TYE] YeYb] Y] YcUbQ4 ^* Ub_ \underline{d}] Qts.] YWecd_\% `_Tbs ^ TYEYBeQDTU \QS_] _ TNTQT TU \QS_ TU VU\YSTQT\%_ TYE YEYB Y \QS_ TU VU\YSTQT\%_ TYEYB Y \QS_ TU VU\YSTQT\%_ TYE$ `UbujQi`^UwWWJ^SQj&e^X_]RbJQcuS_^dbQTnSUQcu]`x]_4TnSU%Q]UnnTQTUce\U\YS1TQT\\edebQ`_bd_T__TuUblj\YQ\Q^USU\YTQT%bQ^d_S_]_ $SeQaeYLb_dtQS_cQ_GYTNSU_aeUTU^db_TUcu] Yc]_3 oE et VL\NSTQT_] YcUbQ\edeb_f_i Qdl^cUs\%QUcds\%L\^UU\square_TUbUbj_YQT_`_bU\Setc_i \Q$ $S_1U_0 = S_1U_0 = S$ $TUVW_{ST}QT_{TV}^{*}TY_{SQ}^{*}$ $S_{0} = \frac{1}{2} \left[\frac{1}{2} \left[$

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@\\%UtatTTU\Qf_\e^tqT = \frac{1}{2} \qq\tau \q

@\%Ubd\T\U\Qf_\e^d\T\ ?_^QX\Q^: Tg\Q5\C

 $i \Q] \YUDDQiQUCds \WZZTQ%i ^_fQQdbQdbTUTY:] YeYbUk e^_%YQvQTYbQVQ_dbQ4`Ub_cY^U] RQbW_%U^ce] Y:] QS_^S\ecYw% Ucd_S_^dbQTYSU4`QbQka \WZZTQ%i __b\QVQSY\TQT i S_]_TYTQT TUce ^UWWW_SQ%i TY:] YeYbce \edeb_\ b_R\U] Qc i] YUDDQQ, QX_bbQb\Q]_\UcdQTU ed\YQTU ed\YQTU ed\YQTU ed\YQTU ed\YYT_T_\ bUc'$

 $: ^SeQ^d_Q_Q_RZJSW^U^S_dQTU_QT_SdS^QWeUXU_dQQT_TUTU]_cddQWeeUXQSU_aeU_cX_] RUUCCUQ^cY_\UC_SUSY_QWLX_] RUUCTU_QT_SUSYQSU_AEU_CX_] RUUCCUQ^cY_\UC_SUSYQSU_AEU_CX_] RUUCCUQ^cY_\UC_SUSYQSU_AEU_CX_] RUUCCUQ^cY_\UC_SUSYQSU_AEU_CX_] RUUCCUQ^cY_\UC_SEQU_UCSYQSU_AEU_CX_] RUUCCUQ^cY_\UC_SEQU_UCSYQSU_UCSYQSU_UCSYQSU_UCSYQSU_UCY_SQSU_UCSYQSU_UCSYQSU_UCSYQSU_UCSYQSU_UCSYQSU_UCSYQSU_UCSYQSU_UCSYQSU_UCSYQSU_UCSYQSU_UCSYQSU_UCSYQSU_UCSYQSU_UCSYQSU_UCSYQSU_UCY_SQSU_UCSYQSUUUCSYQSUUUUCSYQSUUUCSYQSUUUCSYQSUUUCSYQSU$

: ^Ltcdt; S_cQ; Uc \QTYMUUYSQTU \Q; c\j `\Uc] saeYQ;%_]_Q\Q\YRUbdT; \QQWU^SQ%aeU cUbQ d_TQ\Q` UbUSSW^%QTWYTQT%_
`bfYkUW_%U^^YW^^Q; USd_4d_TQ\QTYWUU^SQaeU cU` eUTUTUcUQ\$% d_T__ aeU` eUTUS_^SURYbcU4; TU XUSX_d_T__ aeU\Q;
`bUU^CY_^Uc TU_c Qd_Y^Q^_c] Y;]_c fYU^U^Q\$% QaeU Q] U^eT_ cUfU^_R\WQT_c QUh`\YSQb`_bcu] Y;]_c' #\$` `UcQbTUcec
Uh`\YSQSY_^Uc TUb_SQ] YU^d_i i \QQR_\YS\W^TU\Qc S_cQc Q\Xd_QT_% \W^WwcUbUh`\YSQT_%DQQaeU cUfU^_R\WQT_c QUh`\YSQbe^
`_TUbTUQed_TUdUb_YQS\W^TU\Qf_\e^^QT\%_be^Q`_dU^SQU^U\Q] Q`QbQTUdUb_YQbQce Q^d_Z_f_e\e^AQT4aeUfYU^UQcUb^_
] sc aeU Ucd_%aeU U,X_] RbUdU^Ue^`_TUbTUU\UW\$% U^] eSX_c SQc_c% eUTU XQSUb_ aeU aeYbbQ%aeU Uc e^QS_cQ] ei T\WUU^dU
TU\QS_^dbQT\SS\W^\%QaeU d\U^U\U_TUbTUU\UW\$\Sec_`bi_U\QS_d_TU\U\SS\W^U^U\U\SQc_'

C%:Yce UcaeU] QXQSU aeU SeQaeYUb_dQTYVUdU^SYQaeU Ucd_U^du X_] RbUci] saeY^Qc%uc`QtQ`U_bdUcdQ^\UZ_cTU ce`_^UbaeU _c X_] Rbuc dU^WQ^e^QTYWYTQTie^`bfYUWY__bU^SY] QTU\Qc] saeY^Qc%aeU XQSU aeU\QV_bij QTU ce Tudubj Ys^T_cU Qx^] sc Y^U\Yj' A YU^dQc aeU\Qc] saeY^Qc Ucds^WeYQTQc`_be^QSQecQU^dU^TYj YU^d_%_b\Q] Q^_XsRXTU_RbUb__`b_YUdQY_4\Qf_\e^dQTTU.X_] RbucUTUQQ\Q_BXU^dQSw^TU ^QTQ] sc aeU QRc_\edQS_^dYWU^SQSYWQ

GUSSYu^j >

@\\rundom \tu\\Qf_\e^ndom ?_^QX\Q^: Tg\Q5\c

 $B_fQTbQQQ`UQd_]Qb_dQTUdQ\gamma_i `UbdrUrdUe^Q_RZUSW^%Y_XeRYUbQcYi_YcdQT_`_bQWe^cTU_cUcSbd_ibUcQi_Y^QQc`brSYQUc'=QRuQ_]eSXQcfUbTQTUc_i_i`_bdQ^dUc_]QrdU^YTQc`_b_cQ^dWe_cWbUW_ci_b_]Q^_cWiwc_V_c%_Uc`USQi_U^dU__cUcd_YS_c%eUc_^^e^SQUc_U,`U_b`QbQU^`_TUbTUU_c'@_cUcd_YS_c%_bU,QSeUbT_WU^UbQ,TU_c_dWi_W_cSbcdQ^_ci_dWi_W_c%YSec_Qi_Y^Q^Qc%ubQ^_c]_sc_WQQ^TUc%_sc_CQRQ%_\[\] sc_fYbbe_c_TUd_T_c_\c_V_c\Ww_V_c`QWQ^_c4i_U^ce_T_Sdb^Qi_U^VQ^`bsSdSQ\\UWWQ_]sc_SUbSQ^QQ,SbcdQ^*c]_TU_SeQaeYUbQTU_cec_cUSQc'_o8_^aet_VbUSeU^SQc_^_cTSX_c_TU_Ucd_c\\Ww_V_c%u^*_]_ESX_c_TU_\c_CUSbd_ci_cubj__^Uc%YSec_TUdUw_W_cQi_Y^Q^_c%_b_TeSi_c%__S_]_QWe_U^d_CTU_QCT_Sdb^Qc_aeU_U_cU^dUWQ^\%cY__S_]__e^QS_^\Xbj_QSw^TU_QWe^Qc_TU_Qc_T_Sdb^Qc_aeU_U_cU^dUWQ^\%cY__S_]__e^QS_^\Xbj_QSw^TU_QWe^Qc_TU_Qc_T_Sdb^Qc_aeU_U_cU^dUWQ^\%cY__S_]__e^QS_^\Xbj_QSw^TU_QWe^Qc_TU_Qc_T_Sdb^Qc_aeU_U_cU^dUWQ^\%cY__S_]__e^QS_^\Xbj_QSw^TU_QWe^Qc_TU_Qc_T_Sdb^Qc_aeU_U_cU^dUWQ^\%cY__S_]__e^QS_^\Xbj_QSw^TU_QWe^Qc_TU_Qc_T_Sdb^Qc_aeU_U_cU^dUWQ^\%cY__S_]__e^QS_^\Xbj_QSw^TU_QWe^Qc_TU_Qc_T_Sdb^Qc_aeU_U_cU^dUWQ^\%cY__S_]__e^QS_^\Xbj_QSw^TU_QWe^Qc_TU_Qc_T_Sdb^Qc_aeU_U_cU^dUWQ^\%cY__S_]__e^QS_^\Xbj_QSw^TU_QWe^Qc_TU_Qc_T_Sdb^Qc_aeU_U_cU^dUWQ^\%cY__S_]__e^QS_^\Xbj_QSw^TU_QWe^Qc_TU_Qc_T_Sdb^Qc_aeU_U_cU^dUWQ^\%cY__S_]__e^QS_^\Xbj_QSw^TU_QWe^Qc_TU_Qc_T_Sdb^Qc_aeU_U_cU^dUWQ^\%cY__S_]__e^QS_^\Xbj_QSw^TU_QWe^Qc_TU_Qc_T_Sdb^Qc_aeU_U_cU^dUWQ^\%cY__S_]__e^QS_^\Xbj_QSw^TU_QWe^Qc_TU_Qc_T_Sdb^Qc_aeU_U_cU^dUWQ^\%cY__S_]__e^QS_^\Xbj_QSw^TU_QWe^Qc_TU_Qc_T_Sdb^Qc_aeU_U_cU^dUWQ^\%cY__S_]__e^QS_^\Xbj_QSw^TU_QC_$

GU_RcUtfQ`_bQWe^_c UcSbd_tUc SQfYcdc%aeUc}] R_\YQ^_c Qt] Y^Q^_c S_^_c Ucd_S_c U^QWe^Qc TU UcQc T_SdbrQc aeUcU
`^U^`_b_c SQfYrcdc4U^`QbdSe\QbU^ce ^UWqbe^Qx%QS_tbe`Sw^d_ddQTUY^QdQ_bkwrQi TU Ucqc T_SdbrQc aeUcU
_aeUU_c \\UfQ^QSQR_TU\\QSQ`QSfTQTTU\X_] RbU`QbQXQSUbcUfUbTQTUbQ] UrdUfYbe_c_i c UQecdqRQ^Q9Y_c4i U^QWe^Qc
_dbqc T_SdbrQc' GU`eUTU_RcUtfQbQTU] sc%uc cY^TeTQXQi] UZ_b_RXDSw/S_^dbQ^eUcdbQT_SdbrQ%aeU ucds TU QseUbT_%u^
QWe^_c Qc`USd_c%S_^\QT_SdbrQTU_c QrdWe_c \Wwc_Vc Ucd_S_c%aeU_ Uc S_^dbQ\Qcei Q%u^\QaeUcUTYkUbU^SQ^TU^_c_db_c%
aeUUcds TU QseUbT_%u^QWe^_c Qc`USd_c%S_^\Q_ `YYw^TU\Q`U_bTU_c \Wwc_Vc `QwQ^_c%_c c cUweYf_buc TU: `Yseb_%aeUU\
`QTbUTU\Qduc] _i U\\RUbdrQ\$D% S ^\QT_SdbrQTU\ c cQTeSU c i \ c XbceYQc'

 $B_c[i] esx_YdubucqT_c f_^subs_^uhqsddeT_l aeu_l c QydMe_c Wwc_Vc ucd_Ys_c ||UfQ^QsQR_U^buQsW^s_AU_U^cdd_Ys_a_UW^TUU duylqT_sdyQTUU e^QV_bl_QcUMebQTUU dqbuU^QGU_SW_QtQd_] QbReu^QQdU^SW^QTWUbbTUU_l c'DQbUSU aeU TWUbqQ^U^dbU cu4i % b_RQR\U] U^dU%QT_sdy^QTU\TUcd^_%s_]_c c_cdU^U\Q] Q_bQTUU_l_c%bQXU^QWe^_c Qc`Usd_c%bbw^UQDb_SeQaeVbQaeU cUQce T_sdy^Q$

@\\ruador T∪\Qrf_\e^ndor ?__^QX\Q^^: Tg QbTc

LUDYKYQWE^_TUUN_c dVQe^TUcd^_%5]_ LUc bi' eWQYdU `QQSeQaeYbb\RUbdT%eUS_^tcdUv^eUcd_XQSub_aeU_c ``(y] SQ AU "WY S_] `\UdQ] UYUUUCdY_' GYCU\\UfQ^QSQR_dQ ceUbdUaeU ^_ Uc S_^txdUvUS_^\Qc ^_SY_*Uc S_] e^Uci e^YfUbcQUc aeU \\QXE] QYTQT dUYUTUVQ\\RUbdT%QQSd*YfQWYSQ]_bQ\QC UcaeUJ Q GY_c Ucd_YS_^C_bU\TUcd^_\%eYbUTUSbSeQaeYbbS_cQ`QbuSTQ% Sbu_aeU \\QXE] QYTQT dUYUTUVQ\\RUbdT%QQSd*YfQWYSQ]_bQ\QC Ucd_YS_C_bU\TUcd^_\%eYbUTUSbSeQaeYbS_cQ`QbuSTQ% Sbu_aeU \\QXE_QVYQYYBUTUVQ\\QXEUUTU

GUSSYi^J ≯

: $^SeQ^d_QQ^USUcYTQTTUQf_e^dQTTYYQ$

 $6 \label{eq:continuous} 6 \$

ce ^QdebQUj Q%

 $\label{eq:mcu'eutropy} $$McU'eUTU_RcUtfQbc_RbUd_T_\&eUQ'UcQbTUaeUUcQl_cc_R\WQT_cQS_^SURbQ\We^QcS_cQcU^9Y_cS_]_S_^cUSeU^dUieUtropy.$$$ _bTU^TU\Q^QebQ\UjQ%Qce\W\SYTQT4\Q`Ub\LSSYw^TU\ceU^dL*TY|\YU^d_%6_]__\QRQcUTU\ceccQRY_c`b_`wcYd_ciTUsbUd_c4\QcQ^dTQTTU

 $B_c\ U^s_^dQ]_c\ s_^e^QWQ^sQ^dTQT\ TU\ TWSe/dQTUc\ ^QQc_S^QS_^SUR^yS_^U\ LQCDUU\ ^QUEQUU\ QTU\ ^eUcdQC\ ^b_^YCc\ Q]\ Qc'\ MQ^`UcQDTUC\ ^QC'\ MQ^$ d_T__U, `b_WbLc_ aeU cU XQ XUSX_%L^_c cYW_c `QcQT_c | `bUcU^dUc%L^ UcdU dY__TUS_^_S}_YU^d_%] UTYQ^dU U, SeQ, ^eUcdbQ] UdQwcYSQ%L^_ aeUtluc`UsqQQucqqc S_cqc%lc:\\UfQT_Qe^Q]Qi_b`UblusSYw^TUe^QfUj\\eU4cY^UJ\RQbW_%Qaeud_TQfuQaeUTQdqRQZ_ce\\BYU^dU\\eQbTQT_ `QbQ\\edebQc5_^ce\\dQcUYfUcd\\YQ5Y_^Uc%\Uc`Q5Y_`QbQU\`b_\\YbL_Qx^^_cUXQXU5X_%TebQ^dU]e5X_cc\Y\Y_ci\\YU^UbQ5Y_^Uc'DUb_defY]_c $aeU \land USU \land VV \land VV \lor U \land USQ \land VSU .] \ UdQu(c) S_c \land S_S UBT OT \land VSU OS UBT _S_ \land Q U \land US UBS Q \land US UBS Q \land US US Q U \land US US Q \land US UBS Q \land US US Q OS UBS Q \land US US Q OS UBS Q \land US US Q OS UBS Q OS UBS$

: cd_Uc_TUS\Q]_Q^T_%U^\e\MQbTUTYC\$edb4i e^QQ`\Y5Q5W^Q\Q\j_QM^Q5W^i` \bU&Y6Y_c_TU_c X_] RbUc%| sc aeUQ\Q]_UbQbQ`w^ DUb_] USQ\] Q $aeUTURUbQ_RcUbfQb_cYMeYU^dUBaeUUtcbQ_^QR(Uce`_^Ub%aeUTURUbQCubf] eSX_] sc TYMbY(TUUh`bUcQ_S_^SURYb)Qc S_cQc TUQSeUbf_QQQ$ $fublot[] ublockSQuhQsd0%buQdfQQVQ^QbbQUjQi[QQVb]QTUVQUhcdU^SQTUVQcS_cQcU^VQS_[]`bu^cxw^TfYYQiVQf_le^q0T%bVQ_`ubQsw^TUVcS_cQcU^VQS_[]`bu^cxw^TfYYQiVQf_le^q0T%bVQ_`ubQsw^TUVcS_le^q0TWbVQS_le^q0TWbVS_le^q0TWbVS_le^q0TWbVS_le^q0TWbVS_le^q0TWbVS_le^q0TWbVS_le^q$] $sc Qe^Q`b`_bsw^QQ] UTTQTU^eUcdQS_]`bL^cw%] sc QS_bTUS_^U, ec_UY]`_bdDsw^TU/Qf_j Xe] Q^Q:\\U^weQBUbc TU XUSX_$] ei TUNSYAU U^LUQSW^TU d.b] Y_c 'QQUh' LUCQNQFUSTQT 'LUSXQQSUSQTU 'eUcdQ\ b_'YQ] U'du i cec VQSe/dTUc i _'ULQSY_'Uc' DQQRLQC $edt/YQU^*e^QUc`USYUTUcU^dT_WWebQT_'9UTW^TUc_^%Q]Q_bQTUU_c%6_^Q(bbcU^SQQTUe^QWbQ^SQ^dTQTTUQ)RWMyUTQTie^WhUT^Ucc$ $\text{U^cce c'} \text{WYNSQSW''\% SQCY_^Q^T_Y^e] } \text{UtQR} \text{Ut TeTQc\%TNSe} \text{V} \text{TUt} \text{ i } \text{S_^4ecY_^Ut\%U^1Qc Y} \text{IUdMQSY_^Ut i } \text{S_6d} \text{ fUtc\Qc QSUtSQTU_Qc S_cQc TU}$ \$_] _ c_^i _c aeU cU Q`\%Q` Q\QUh`\bUcQ\\$_cQc Y^dUb^Q\i Uc`\%deQ%\Lcds^\$QCYd_T_c`\bUcQQT_% cU ed\Y`QU^e^QUc`U\$Y\TU cU^d\f__\WWebQT_' $9 \ \mathsf{UTW} \mathsf{TU} \ \mathsf{c}_{\mathsf{N}} Q] \ \mathsf{Q}_{\mathsf{L}} \ \mathsf{LQ} \mathsf{TU} \ \mathsf{U}_{\mathsf{L}} \mathsf{c}_{\mathsf{N}} Q^{\mathsf{L}} \mathsf{U}_{\mathsf{L}} \mathsf{C}_{\mathsf{N}} \mathsf{Q}_{\mathsf{T}} \mathsf{U}_{\mathsf{L}} \mathsf{Q}_{\mathsf{N}} \mathsf{Q}_{\mathsf{N}} \mathsf{Q}_{\mathsf{T}} \mathsf{Q}_{\mathsf{T}} \mathsf{U}_{\mathsf{Q}} \mathsf{Q}_{\mathsf{N}} \mathsf{Q}_{\mathsf{T}} \mathsf{Q}_{\mathsf{Q}_{\mathsf{T}} \mathsf{Q}_{\mathsf{T}} \mathsf{Q}_{\mathsf{T}} \mathsf{Q}_{\mathsf{T}} \mathsf{Q}_{\mathsf{T$

\cTYcUc'

\ aeUUcfUbTQTUb%cUcYMeUaeU^ cw\ \Qf \e^qQTTU]U^ducSbUQTQc%Ub\Qf \e^qQTTU9Yc]Yc] Ybc^USUcQbYU^dTQccec @ aeUUhddQvQT Sdb^QUctcdQ%U^S ^qtQTUdTQc ^eUcddQcYTUQcTU,T] YY TU9Yc5o^ cUTUcddei Q\QW(bQTUce\\RUbdQTTU $\label{thm:linear} \begin{tabular} \label{thm:linear} $$\operatorname{Licdu'}(a)^* = \operatorname{Licdu'}(a)^* = \operatorname{Licdu'}(a)^*$ ^USUCYTQT TU, cUv b= RRU U^d TQ: \Q: S cQ: aeU9Yc dW1U aeUfUbS ^5 oB `QbUSU bU`bUcU^dQbU, RU^TXl 9Yc S] e^cUbTU \MQ^S_]`bu^c\w^%QcuS_] _ U\`_TUbi \QUNSYU^SQ%Ub_d_TQfuQTUZQbU cY^e^dUcdQ] U^d_`QbQU\UNXbU^dbu'd_T_c_c_RZbd_cTU^db_ TUce `e^d_TUftd5 : ^bbce] U^% QbbSUaeUdtU1U, RU^T\d_9\f{c} e^Q\bc`\bS\UT\U] Y\f{c} d_d\d_T`_T\bc_T\UT\cd^_\%QZ ce Y'\\eU'\S\Qe^\fUtcQ\i ce`tU]_4S_]__\eUU\cU^d[\Yu^d_\b_\Uc_TUQ\\e^_cTU_cQ^d\\e_c%eUU\TUcd^_UcdQRQ_bU^S\]QTU

?_^QdKQ^: Tg QbTc @Q\YRUbaQTTU\Qf_\e^dQT

@\\rutator T∪\Qf_\e^qtor ?__^Qt\Q^`: Tg Qt/rc

S_] _ VQSQecQi VQIQ w^TU cec cQ^d_c TUdUd YQSY_^Uc' M%Y^U] RQ\$W_%6eQ^T_ XQR\Q] _c TUSQecQi UYUSd_%Q^TUSUITU^dUi S_^cUSeU^dU%46^TQ] U^dQ,i TU`U^TYU^dU%QTUdUd YQSW^i TUSTYTQ%U^U, bij UbGUbaeU UhYcdu`_bcu] Yc] _%*TU`U^TYU^dU% TU\Qc\j `\YSTQT i VQY`] edQR\\\TQT `Ub\USdqi QRc_\edQ\% \Q`bij UbQSQecQTUd_T_ S_cQc4c\^TeTQTURU cUb] U^_bTUS_b_ U^ dQ\Uc BU`BUCU^dQSY_^Uc%aeU SeQ^T_ XQR\Q] _c TU cUBUc TU`U^TYU^duc TUbYQT_c%aeU cUQWQTQ^% cecSU`dR\\uc TU] edQ\$\w^ `Ub`UbQi \QceSUc\w^

^USUcQXQTUdUb] Y^Q\$Yw^TU\Qf_\e^dQTTU9Y_c%U^d_TQc\Qc\S_cQc%_b_ aeUfUQcUb] sc\eUduli] UZ_b E eUd_TQ\Q\eUbj Q $Q`QUU^*dUTU^*dQUu^*_RZUSY_^*u^*i\ U^*SQ]\ QSY_^*u^*CTURU^*Cell/NbTU^*e^QY]\ QW^*QSYw^*aeUXQi\ QWk^^dY__TU^`bY^*YUWY___VQTYW^*YQTTUU'$ UcdQbcY^e^Q^USUcYTQT]_bQ%QUcS]_XQbs aeUcUQYj_`_cYR\UXQSUbSeQaeYUb_dbQaeUcYU]`bUU\UWb_aeUuc]UZbi] sc cQRY_4S_] _ cY^_ XeRYUbQQWe^QTUcf U^dQZQ%Q] Uj aeY*TQT% ceZUSW^%U^dQ\ ^uSUcYTQT4e^QS_cQ`_b\QaeU cU\\j YdQ\Q $f_{e}dDT\%_{e}DTW_{e}D$ UYYYU^SR\Uc RbJU\Q% b\Q; c aeU\ dJ^Q^bs`YT % aeU` TtQ\YJU ^YW6^Q c\YVY\Y6Q\c\QY \Qbs ce f YTQTU A YU^bQc\lbtc $TURU \ cUbd\ TQ/Q] \ UbQ/j \ QM^QSW^i \ /Q%ec'W^B \ Uc \ ^YWe^QTUcf\ U^dQQ \ U. TUCX \ ^bQe^cub% USUcQbQ \ U^dU \ ^QbQQSdeQb$ $TUQ] Q^{\prime}UdQ] sc UhSU,U^{\prime}U^{\prime}W^{\prime}W^{\prime}UQ^{\prime}UdUSSW^{\prime} ^{\prime}USUCQDQTUce ^{\prime} b ^{\prime} ^{\prime}Q^{\prime}QdebQU^{\prime}Q : cd QR_WQ^{\prime}W^{\prime}A^{\prime}Q^{\prime}J ^{\prime}UbUSSW^{\prime}W$ YYUDY_BTQT_TU`U^TU^\$Q%Y^YV\e^Q\Q\Q\DTUTYWYTQT% bf\YUWY_Q\SU^c_'B_UC Y^S_]`QdR\US_^\Qc_RUbQ^QRc_\edQi `UNUSADTU 9 Y c'@Q c RUbQ^uDTU 9 Y c Uc ce SQ`QSYTQT i \Q Qed bYTQT `QbQ XQSUb\ aeU \U QWbQTQ4` bU\aeU cU XY S ~V b] U Q cef \e^dQT U^U, UZ bSd TU, SYU, % U^dU\ c XQRYQ^dUc TU\Q dZbbQ4i ^ XQi aeYU^TUdU^WQ ce] Q^ % \UTYWQ8 oaet XQSUc &@ccYNeYU^dUcScQc`UbdU^USU^Q\Qc RUbQ\QTU9Yc3QcQRUb #'\$Ge`bU] %`_TUbYYM'd e^YfUbcQ\`_bU\ aeUt\Uc SQ`Q; TU XQSUb_aeU\U`\Q; SQ%c^S_^db\%c^^YWk^^d/_TUS_^VYQ] YU^d_TU UcU`_TUb%c^^YYWk^^d/_TU $\label{eq:cezusyw} $$ \c^2_b = UTTQWQ \eq_aeYUb_ddQ^dQ^eYVW^^YW^^R \c^2_B = UUCdbSSW^aeU \eq_aeYUb_ddQ^dY^YWW^_R \c^2_B = UUCdbSSW^aeU \eq_aeYUb_dQ^dY^YWW^_R \c^2_B = UUCdbSSW^aeU \eq_aeYUb_dQ^dY^YWW^_R \c^2_B = UUCdbSSW^AeAU \eq_aeYUb_dQ^dY^YW^_R \c^2_B = UUCdbSSW^AeAU \eq_aeYUb_dQ^AU \e$ $U^QRC_{ed} TWDY_QLV_SeQ_{ev} VDCef_{ev} V$ TURU TUBY QxU% aeU TURYW UcdQbU^SeQaeYUb^USUcYTQT TU4dQ^\UZ c TU Ucd %aeU U, LUcd TU\Q U^UbMQ cUTUBY QTU t\% Uc QRc_\edQ] U^dUTU`U^TYU^dUTUt\'

##'\$EeUdW^UQed_bTTQTce`bU]Q4TUbUSX_QRc_\ed_i`Ub\USd_`QbQXQSUb_aeUae\UbU%^\ceZUSW^Q^Y\We^QQed_bTQTce`ubY_b%
_ SeQae\UbTUbYQSw^TU\QQed_bTQTTUSeQae\Ub_do_%_\Q\\]YQSw^_b^Y\We^QQed_bTQTYTU`U^T\UdTCd\dQ\Qed_bTQTCe`ubY_b%
ce`UbY_b\%\WeQ_Y\UbY_b4c\U^T_t\U\Z\WTUd_T_U\T_]YY_%\Q\eU^UTUd_TQQed_bTQT4idQ]RY*\c\\bucdbSSw^\`_bSeQae\Ub
_R\\\QS\W^\alpha_aeU\\]`\\SQiQcuQ\QceZUS\W^\\UdfQS\W^_TU`U^TU^S\Q\\Q\\Q\\\\Y\\Y\\QS\W^\QTUSEQTQ

#'\$EeUcef_\e^dot uc ce`ku] Q%_ TubfQTQ%JYTU`U^TU^dUTUSeQaeYubS_cQcY^t\4cYU^T_ U^SQTQS_cQTudud] YQTQ`_bce
`b_`YQTUSYYW^%Q,^_dU^Ub_ddQkUMQ`Ub_ce`b_`YQcQRYTebuQ4ce^_fQQucdqbceZdd_Q%_kucdbYWNT_`_b\Qf_\e^dot TUSeQaeYub
db%_db_c ducdQ] U^d_c cYU^T_`Ub\U5dQ] U^du ceZbQQ\Qcei Q

@\\ruadot τυ\Qf_\e^dot ?__^QXQ^^: Tg QbTc

t/U/SQI_Y_TU/QYdJ/WWYSQ588_XQ _ddQc_RUdQ\QTYYYQ`Ub_Ucd_4i_Ucd_Uc QTUSeQTQI_U^dUc_RUdQ\QQRc_ledQ3^_db_Uc
TUcUQR/U4^YdQI_`_S_SeQaeYUb_db_cUbX__bQR/U_WJY_i %TU XUSX_%_XQ _ddQS_^SUR%\U_`_cYR\UB: c \QWL_bQi_\QWIQ^TUJ_QTU
\QG_RUDQ^QTYYYQ%aeU\Qf_\e^dQT_TU9Y_c Ucds_TUdUdj_YQTQ`_bce `b_`Y_YYYYdj_%QcQRYTebuQd_TQceVISUYdUU^d_TQc \Qc S_cQc4i
U^^QTQU^QRc_led_Ucds_RYU^TXMWT_`_b^YW6^QcQRYTebuQYYUUY_B%_`_b^YYW6^QcQRYTebuQ4]_UTXQ*dU_XSeQ,cUS_*YUddbuQU^\Q
QRXddQXUTQT_cY^cU^XT_%QTUdUdj_YQSW^i_QSw6QbcY^bQ_w%YYUV_%_Q,VYQ!

 $f_{e}^{-1} = \frac{1}{2} \left[\frac{1}{2}$ $S_{\text{A}'} \text{AVW}^{\text{A}'} \text{AVW}^{$ `_bU,fYU^d_YSWbbQTU.S_^dYWU/SQSYMQ%aeU.cU.We.Q`_b^YWe^QcQRYTebuQ%YYWk^]_df__%YYWk^TY6dQT_YYdJXWU/dU.aeU.cUQ%#YdQ,S_cQ.VeUbQ `_cYR\U\$%6Y^TeTQQ\$M&]U^qQbe^Qk<u>d</u>WkQT_TUYj`\U\$U\$S\$W^i\Q]UjaeY*TQT%^YY^XQ]U^qUTYW_TU\Q9UYTQT'GYUce^QTUcfU^qQ\$Q`Q\$Q\Q f \e^dQTTYfYQQ\QaeUqc\cdbs^S ^UcdQ^USUc\fqT] bQ%u^d ^SUc\Q]sc\\RbuTUU\Q% SeQ^d]sccU\eUQ,QjQ\%Q]Qi bT\\W\fqTi\Q fU^dQQ M%U^S ^cU5eU^SYQ% QtQ:cUb`UbU5dQ] U^dU\YRUJTU\QTYUSSW^TU\QS] `UJY~\%% e^YUbcQ] U^dU; cUTUQJS] `\UdQ] U^dU; TU U^TU^SQTU\Qf_\e^dQT TU9Y_c%eU ce cQR\Qf_\e^dQT ce` bU| QUc ^USUcQbY_%TU_ aeU c_cdU^U e^QTU U^TU^SQTU ce cUb%eU ce United/Stoluc nusucopic Gyuc QW_TU] Qciqt_RQZ `QbQ U, GUbGe`bU] _ `QbQaeU ce f_\endt Tudub] YrqtQ `_b nusuc\fqt] _bQ\%TU] _t_aeU ^USUCQXQ] U^U%U^^d_T_c_c SQc_c%u,aeUtUbU^U,] sc Q\d_WQT_ cQ^d_i VU\Y4U^d_^SUc o`_baet ^_ Uc dQ] RY ^Q\W_TU] Qc\QT_ RQQQ`QtQaeU $\texttt{t} \setminus \texttt{d} \land \texttt{WQ} \texttt{ce} \ \texttt{Uh} \land \texttt{d} \land \texttt{SQW} \land \texttt{Q} \land \texttt{V} \land \texttt{V} \land \texttt{Uh} \land \texttt{$ TUCX_^bQceQSdeQbcQ^qQiicQRYQjU^du McY^_UcTUCX_^bc_aeUcUb^USUcQbQjU^ducQ^qQiicQRYQ%U^U,] Qi_bWtQT_`_c'R\U%_Uc] scaeU $\label{eq:condition} $$ V_1 = V_2 - V_2 - V_3 - V_4 - V_4$ $SQc_c\%_aeU\%_bU^S)]QTU_dTQc_VQ:TU]scS_cQc\%Lc]UZ_bi]sccQRY_'McY^_UcTUCX_^b_c_aeUcUb^USUcQbQ]U^dUcQ^dQicQRYQ%L^ULUB'USUcQbQ_UcQbQicQRYQ%L^ULUB'USUcQbQ_$] Qi_bWbQT_`_c/R\U%_Uc] sc aeU\Q] UTQi TUCX_^b_cQ%USUCQbQ] U^dUQSdeQbcQ^dQi cQRQ] U^dUU^U,] Qi_bWbQT_`_c/R\U4_%_aeUUc_] 't`] _% QtQ XQ9UbUc_%J^d_T_c _c SQc_c%_ aeU%_bU^SJ_QTUd_TQc \Qc TUJ sc S_cQc%Jc] UZ_bi] sc cQRY_' McY^_ Uc TUcX_^b_c _ aeUcUb ^USUCQAQ| U^dU cQ^dQi cQRYQXU^U,] Qi_bVMQT_ `_cYR\U%` Uc] sc aeU\Q] UTQi TUCX_^b cQ%'USUCQAQ| U^dU Q\$deQbcQ^dQi cQRYQ| U^dU U^d cQRY'

@btg w^`_b/QaeU^_ Uc TUcX_^b_c_ cub^UsUcQbQ| U^dU] sc cQ^dQ%Uc TUSU%_baeU/QcQ^dfQT U^cu] $\[\] \] Uc e^QS_cQUhSUU/UU i X_^bQR/U' D_b/Q] \[\] Qbtg w^%_ Uc ^^V&_^QTUcX_^bQcUb^UsUcQbQ| U^dU] sc cQRY_c% %u^SQTQSQc_% QbQQ5deQb] sc cQRQ| U^dU% _ XQSUb_ aeU Uc U,] sc cQRY_TUd_T_c4/QcQRYfebtQUc dQ] RY_^Ucu] <math>\[\] \] UhSUU/UU i X_^bQR/U'$

 $\begin{tabular}{l} : \ed b`bi ub`\Q^_] u^SY_QT_TU, : \cQ _ c_RbU\Q\RUbaQTTU\Qf_\e^dQT\%! S'S_]_ cUXQ_RcUbfQT_%bi bbcU^dQaeU\Q $$ T_Sdb^QTU, cubTU\Q9 \for YQ]_\e^dQT u^SQTQS_cQTU\dd \for YQTQ^USUcQbQ] u^du`_be^QQ`ddeT ce`ubY_b\%_]_ XQSUbaeU U, $$ Y_C RU^T\d _ e^QUc`US\UTU] \cdot Ycd__] ^Y_dU^dui] uTY_] uSs^\SQTU\TUcd^_4i \cdot Yc\cdot \dot Y\deC \uddat U\d \cdot Y\d\uddat Y\d\ud$

@\%Ubd\T\U\Qf_\e^d\T\ ?_^QX\Q^: Tg\Q5\C

6cuaeU%UWk^UcdUQed_b%_^YU^T_ Ucd_cfQbY_c`QcQXUcTUUcdUU^cQi_ Ze^d_c%_ XQi fYbbeT%YS_cQQ\We^QTU^QbebQ\Uj Q] _bQ%U^_c Qsd_ci $TWVQ\%\% \ bU^S \ QTU \ dTQc \ VQcTU \] \ sc \ S \ CQc\%J^V \ b \ QT \ UhSUJU^dUc\% \ Ub \ cwl, \ S \] \ = e^QUc` USYUTU \] \ USS ^6 \ TU_TU \ dt^4 \ 4i \ U^V \ aeU$ $XQSU \ aeU \ U, ZeUj \ i \ \underline{W}. RUb^*QT_b] \ \underline{L}Q, TU,] \ e^*T_\% aeU \ \underline{C}ULSU \ \underline{V}UhSUU^*SQ] \ \underline{L}Q, WQSU b \underline{UZUBSY}. XQi \ \underline{W}UbBUT \ \underline{U}^*UbBUT \ \underline{U}^*UbB$ $$$ ^USUCYTQT]_LQ_{\theta}eUUC_{\theta}U^UC_{\theta}Q_{\theta}[X_{L}] (C) = S_{\theta}QUSUC_{\theta}TQT (C)Q_{\theta}Q_{\theta}Q_{\theta}(C)Q_{\theta}Q_{\theta}Q_{\theta}(C)Q_{\theta}Q_{\theta}(C)Q_{\theta}Q_{\theta}(C)Q_{\theta}Q_{\theta}(C)Q_{\theta}Q_{\theta}(C)Q_{\theta}(C$ TUBUG| Y'QS_^cdQ^dU] U'dU i TUCTU\eUW_`_be^QQ`ddeT ce`Ub_t% aeU ^_ Uc`_c/R\U`QtQt\QSdeQbTU_dbQ] Q'UbQ McYUcd\c S_cQc c_^Qcu% YcdQ^SQ58_^cYTUIQ?T_aeU%cVVk^\Qc:cSbbblQc% dQ] RY_^U,cU^dT_S_1x^TU\QXe] Q^YTQT%_Uc QcuAU^_1sc] v^j _%LcdQR\USUb UhSU`SY_^Uc Q,X_^_bTUSeQaeYUbcUb%aeU QddQftcTU\Q`UbUSSW^]_bQ,TU ce ~QdbbQUj Q^USUcQbQj U^dU aeU Q5dkQS_^cQRYTebuQce`bU] Qi \Q $\label{eq:constraints} \text{constraints} \text{c$ \QQ`ddeTTU\QcS_cQc%c^U|RQbM_%__XQ\$U4`Ub_ce\bUQcu]\c]_QcUbThbWnTQ`_b\QQ`ddeT4i aeU%U^UcqQS_^TeSdQ%aeU1j\dQU\9Y_c $RU^T\underline{M}_{\underline{M}} - MCY^U\underline{J}_{\underline{M}} + MCY^U\underline{J}_{\underline$ `eUTUU\UM\$%\J^S_^dqQTU\QS_^fU^YU^SQTU\Qc.S_cQc% Ub_aeU^_ `eUTUU\UMbU^S_^dqQTU\QS_^fU^YU^SQTU\Qc.S_cQc4S_] _t\TY\$U%#'-+#% $aeU ^ L ` _c/R/U aeU 9 \\ \underline{'} c QSdkUTU _ dQ] Q^UbQ aeUTU QSeUbT _ S_^UcdQ Q ddeT%T_^TU XQ; QWe^QS_^TPSW^VbCQ _ QR__^TQT U^/Qc S_cQc'_i \\ \\$ TULUIG YQTQ`_b\QQ`ddeTTU\QcS_cQc';`Ub_ce\UQQcu] \td]_QcUbT\b\WTQ`_b\QQ`ddeT4i aeU%\\^UcdQS_^TESdQ%aeU\j \dQU\9\cRU^T\d_4\c\^ UJ RQbW_cUce`_^UaeUUc S_^dbQbY_S_^U,9Y_c RU^TYd_'4B_ Uc aeUcUce\bUQcu] \tc] _ QcUbTYbWTQ`_b\QQ`dbtY%eq?T_ cU`eUTUUUWb\b\ `_c/R|UaeU9Y_cQ5dkUTU_ddQ] Q^UbQaeUTUQ5eUbT_S_^LcdQQ`ddbT%T_^TUXQ QWb^QS_^TY5W^VbcYSQ_VQR_^TQTU^\QcS_cQc';Gu%t\ $\label{eq:condition} \text{ce`$_^1$/$} \text{ reb} \text{ L} \text{ L}$ $TUUU_1 YQTQ`_b QQ`ddeTTUV_C: S_cQc'; `Ub_ceVbUQcu] Yc]_QCUbTYBWWTQ`_b QQ`ddeT4i aeU%U^UcQS_^TeSdD%aeUY_1YQUU, 9Y_c RU^TYd_4McY^CUBWTQ`_b QQ`ddeTAU QCUS_^TeSdD%aeUY_1YQUU, 9Y_c RU^TYD_4MCY^CUBWTQ`_b QQ`ddeTAU QCUS_^TESDD&AU QCUS_^TESDD&AU QCUS_^TESDD&AU QCUS_^TESDDAU QCUS_^TESDDAU$

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